MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

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CONSTRUCTION
Randy Randolph's CHEETAH .15

CHOOSE THE RIGHT PROPS & POWER for Scale Flight

Twin-Turbine
Me 328

KRC Electric Fly-In

Bombers to Bleriots

—page 32

FIELD & BENCH

HOBBY LOBBY
PBY electric

TOP GUN
MiG-29

HOBBY SHACK
Air Master 40T

MAC National Championships

Aerobatic big birds over California Hill

March 1998

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MODEL AIRPLANE NEWS

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PRINTED IN THE USA

MODEL AIRPLANE NEWS

March 1998 • Volume 126, Number 3


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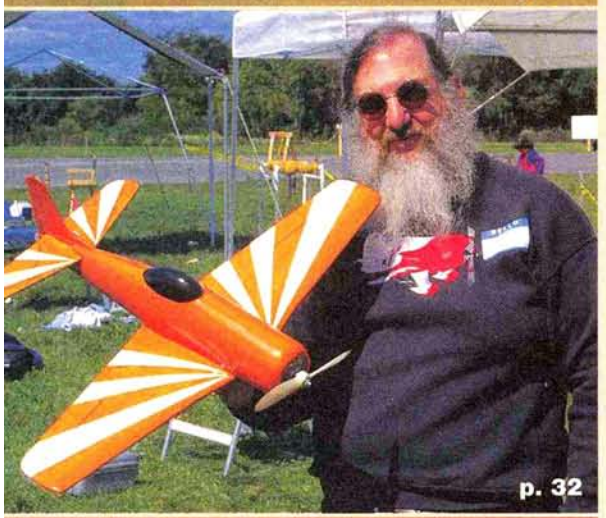
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ON THE COVER: George Vogelsang's Me 328 takes off on another spectacular flight (photo by Jerry Nelson). Inset top: Keith Shaw impressed everyone with his Bear Kitty. Inset bottom: Lloyd Shultz's original design sits on the runway, ready for take off.
ON THIS PAGE (top to bottom): IMAC National Championships; Hobby Shack's Air Master; Keith Shaw and his Astro 020 brushless-powered Bear Kitty.

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EDITORIAL

by LARRY MARSHALL

THE CASE OF THE MISSING ARFS

We attend trade shows to get a feel for trends in modeling, to see the new products and to talk with the manufacturers. Over the past couple of years, there has been a consistent theme: ARFs, ARFs and more ARFs. The major manufacturers tell us that they are selling several times as many ARFs as they sell model kits. I've heard estimates of 3:1 and 4:1 ratios of ARF/kit sales from companies selling both. The result, of course, is that the manufacturers are bringing to market more and more ARFs while, at the same time, they are concerned about their kit sales.

In contrast, when we talk with modelers, we often hear a vigorous dislike for ARFs—a view that while ARFs may bring some people into the hobby, they bring them in as flyers, not modelers and that without a willingness to move beyond ARFs, most of these people don't remain in our hobby very long.

Dave Grife's 1/4-scale, 18.5 pound Travel Air Mystery Ship is a good example of the possibilities available to electrics flyers.

This difference of perspective between the manufacturers and modelers on the flying field is interesting, and ARFs serve to fuel the fires of debate that keep some of us warm during the winter months. After all, you have to have something to talk about between flights, especially when you're cold. But there's an even more interesting phenomenon associated with almost-ready-to-fly aircraft and it is that most of them are missing.

What do I mean? Well, if the manufacturers are selling ARFs in a 3:1 ratio relative to kits, we should see this same ratio at the flying field, shouldn't we? But we don't. I haven't done any hard-data collection, but when I head to flying fields, what I see is that the ratio of ARFs to kit-built models is more like 1:3 rather than 3:1. Thus, a lot of ARFs being sold are 1. crashed at a very high rate, 2. bought and never built, or 3. abducted by aliens somewhere between the manufacturer and the flying field.

My feeling, and it is only a feeling, is that only the second possibility is plausible, as I don't see that many more ARFs being crashed at flying fields—at least no more than kit-built aircraft. I also think that if aliens could abduct model aircraft, they'd be more likely to go ahead and grab some of the beautiful scratch-built models I see so many guys producing. You know ... show up over Top Gun one morning and suck a bunch of them up.

So, if lots of ARFs are being bought but not built, why is that the case? Are ARFs too hard for someone with no experience in R/C to build? That's what some people have claimed, and new bolt-together ARFs from several manufacturers are addressing this possibility, with new ARFs requiring no glue for assembly. Are ARFs being purchased by wannabe model airplane flyers who find they just aren't interested in even the minimum effort required to build an ARF?

Are there a bazillion ARFs, given as Christmas and birthday presents, languishing in basements all over our planet? Possibly. It's certainly true that most clubs have a situation where only a very small percentage of their membership actually fly. Are ARFs being purchased by the guys in your club who you never see? I'd like to be able to provide the answers but I'm still scratching my head over the observations. What do you think is going on? Where are the ARFs? I'd really appreciate your input on this subject; what's happening in your club?

IMAC, ELECTRIC FLIGHT AND SCALE SPEED

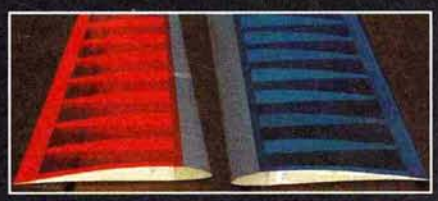
Everybody likes to fly aerobatics and most folks enjoy scale airplanes. The International Miniature Aerobatics Club brings both of these aspects of model aviation together in a growing phenomenon: IMAC competition. Here, pilots fly the full-scale International Aerobatic Club maneuver sequences using scale models of full-size aerobatics planes. This month, Dan Wozanski, western regional IMAC director, takes us on a trip to the IMAC Nationals.

Guy Fawcett shows us the happenings at the KRC Electric Fly, which is still the largest electric R/C event on the continent. Everything and anything is being flown with electric power these days and Guy gives you a small glimpse into this growing segment of our hobby. In addition to Guy's coverage, I had an opportunity to photograph and talk with Keith Shaw about his incredible electric-powered Bearcat, and we feature the plane and builder in our "Readers' Gallery" this month.

Greg Hahn takes a somewhat different approach to scale speed. Rather than trying to define it in such a way that judges can assess it, he shows us how to obtain it by properly powering our models. I hope you find his article as interesting as I do.

Carbon D-Light

According to ICARE, manufacturer of the Carbon D-Light, the best composite construction techniques free-flight has to offer have been incorporated in this R/C hand-launch glider. The fuse, which weighs only 2 ounces (with pushrod tube, wing hold-down and canopy), is of white fiberglass construction, while the wing, which features unique molded-carbon D-box construction, is very stiff and has an extremely accurate leading edge and airfoil (S4083) shape. This is accomplished by pressing a pre-shaped foam D-form with a layer of carbon into a female CNC-machined mold. The rear of the wing D-box is faced with light balsa shear webbing, while the rear of the wing is traditionally built up in balsa. The root ribs, transition ribs and wingtips are of a balsa/carbon sandwich construction. The D-Light comes covered with Oralight and has a flying weight of 10 to 12 ounces. ICARE offers this kit as an RTF and leaves only the three wing sections and the V-tail assembly to be glued into place. Install two microservos, balance it, and the D-light is ready for thermalling. Specs: wingspan—60 inches; wing area—365 square inches; wing loading 3.95 to 4.73 oz./sq. ft. For more information, contact ICARE Sailplanes, 381 Joseph-Huet, Boucherville, Quebec, Canada J4B 2C5; (514) 449-9094; fax (514) 449-3497.



Violett MiG

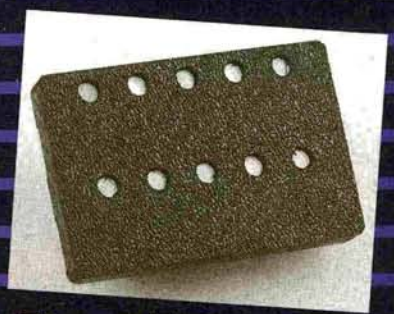
The MiG-15 has certainly proven itself a great subject; its scale proportions and simple design make it perfect for modeling. In various sizes, the MiG has demonstrated fantastic handling characteristics both in the air and on the ground—pleasant characteristics approaching the docile demeanor of a sport plane. Combine this history with BMV's reputation for the latest in model construction techniques, and this new 68-inch-wingspan offering could be a study in miniature-jet perfection. Well-known designer Dave Ribbe applied 3D computer-design techniques to make this MiG easy to build with features like laser-cut balsa flying surfaces. The overall result is a strong, light model that also happens to be quite affordable. Everybody wins! The wings and stabs plug into the detailed fiberglass fuselage, so transportation and storage aren't a problem. Offered both as a ducted fan and as a turbine-powered kit, the MiG can be built as a 6-channel jet trainer or, with its perfect scale outline, as a 10-channel scale-competition machine. On its debut, Dave took third place at the second World Jet Masters. For more information, contact Bob Violett Models, 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020.

1923 C4 Autogyro Kit

According to Autogyro Co. of Arizona, their new C4 is the only wingless, sport-scale autogyro available in kit form that the average modeler can easily build. Construction requires no machining or special tools. This 1/9 sport-scale autogyro is modeled after the first successful full-scale autogyro ever flown by Juan de la Cierva in Madrid, Spain, in 1923. This deluxe kit incorporates laser-cut parts, hardware, fuel tank, prebent landing gear and computer-generated full-size rolled plan sheets. All parts are bagged and labeled to follow the step-by-step, illustrated construction manual, which also, by the way, includes flying instructions. The C4 has a 50-inch rotor diameter and uses any sport .40, 2-stroke or .52 to .56 4-stroke engine. No special mixing radio is needed; any simple, 4-channel radio will do. A 30-minute video is also offered; it features an overview of the C4 and its blade tracking, initial test-spinning the rotor into autorotation, and several flights!

Autogyro Co. of Arizona's slogan is: "We fly what we sell! We are always available to offer tech support to our customers!" For more information, send an SASE to them at 3307 West Renee Dr., Phoenix, AZ 85027; (602) 582-9428; fax (602) 582-9428. To order the C4 Autogyro kit call toll-free (888) 783-0101.

To me, a glow plug is a vital component for dependable glow-engine operation. It's the first thing I check if I'm having a problem. Why, then, did I abuse my poor glow plugs by letting them roll around on the floor of my flight box for so many years? A glow plug that has been "tarred and feathered" with balsa dust and part "B" of the emergency-repair epoxy just can't be operating at 100 percent ... I don't think so! I'm truly a contender for the "Heavyweight Dunce" world title when you consider I run mostly 4-strokes and the plugs cost about $10 a pop. Enforcer Mfg.'s new Plug Paddock guards your plugs' delicate elements, keeps them all in one easy-to-find place and protects your investment—not just the $10 investment in the plug, but also the cost of an entire airplane that could well be lost in a crash because of a dead-stick engine caused by a mistreated glow plug. I almost forgot! The back of each threaded hole is shielded with clear plastic, so without removing it, you can conveniently light the plug to see whether it glows properly. The white areas can be marked with a pencil so that you'll quickly be able to identify your plugs by manufacturer and heat range. In my opinion, here's a totally cool product for only $6.95. Available direct from Warehouse Hobbies, 1180 C.R. 621 East, Lake Placid, FL 33852; (888) 444-1995; Florida residents (941) 699-1231; fax (941) 699-0360.



Enforcer Plug Paddock

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email **man@airage.com**. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

LIKES ELECTRICS COVERAGE

I really enjoyed reading Bob Benjamin's article, "F8F Bearcat," in the November '97 issue of *Model Airplane News*. It once again proves how practical electric power is becoming with the advances in motors, batteries and speed controls. Just a few years ago, converting a gas plane like the Bearcat to electric would have been impossible.

With electric power, the noise issue, which is causing us to lose so many fields, would finally cease. I also think not having to worry about fuel-proofing the engine compartment and markings would be a definite "hit" with such a beautiful airplane.

Please keep up the good coverage of electric power alternatives. The fast pace of electric component developments should provide many interesting articles in the years to come.

WAYNE DAVIS
via email

We're glad you liked Bob's conversion of the Aerotech Bearcat. One of the things that's causing electric flight to become more popular is the absolute reliability of the power systems. Because of this, it's possible to fly these beautiful scale planes closer to you without fear of engine failure. But you're right, the clean and quiet virtues of electric power are also great.

Electric flight is growing by leaps and bounds, and we intend to cover its growth as long as Model Airplane News readers want to see it. Thanks for your input. LM

B-24D PLANS

You responded to a reader inquiry regarding availability of plans for a Privateer, which is a B-24 derivative. You said you were not able to help him find plans, but you recommended one of your advertiser's kits, which could be adapted. Please be informed that another of your advertisers, Palmer Plans, offers two sizes of B-24D plans.

DAN PALMER
Palmer Plans

I did know that you produced B-24 plans but until you pointed it out, I didn't realize you had plans that even bordered on the size that Rick Shaw was after (he asked for 80- to 100-inch wingspan); I was only aware of your 14-footer. Thanks for the correction.

LM

FOX .46BB

I greatly enjoyed Dave Gierke's article in the November '97 issue on the new Fox .46BB engine. The detail and completeness of the article were impressive. Also, I would like to mention my enthusiasm for the Fox engines. I purchased my first Fox engine (an Eagle ringed .61) in 1992. I am still using it to fly cameras and other commercial equipment. The reliability is unsurpassed. With this new .46, designed to operate with high torque at lower rpm ranges, I think Fox has again foreseen a modeling need and delivered it just in time.

Lower prop rpm means lower decibel levels and until now the only way to get that was with the expensive and often hard-starting four-cycle engines. Also, larger-diameter props with shallow pitch can deliver massive thrust at scale speeds. This engine is for a wide range of model designs and particularly for fun flyers. Imagine what it could do for multi-engine designs. Modelers need to appreciate the devotion Fox has shown to our sport and try this new engine design. I have mine on order and can't wait to try it out.

JIM BASS
Roswell, NM

I'm not sure what problems you've had in starting four-cycle engines, but I concur with your other thoughts. Fox, especially their new line of engines, deserves a look. You'll also find that Greg Hahn agrees with you about larger props being better for scale airplanes. See his article on scale speed in this issue. LM

3D WING LOADINGS

Dear Larry (Renger),

Re: your article in the December '97 issue of *Model Airplane News*. For those using the unit stone/furlong^3, it might be useful to use furlongs per fortnight when calculating velocity V.

1 furlong per fortnight =
5.46×10^{-4} feet per second=
3.72×10^{-4} mph

CARLOS FONDREN
Shelter Cove, CA

Indeed, your assessment of the units for velocity in the furlong/stone/fortnight system are correct. I apologize for the omission, but the text of the article did not require velocity calculations Thoroughness, however, should have required that the data be included. Thank you for making up for my lapse.

LARRY RENGER

PARTS TEMPLATES

I remember reading an article on scratch-building planes, and the author mentioned a product called "See-Temp," which is a clear plastic material that you lay over plans and score the outline of something with a hobby knife. Then you break along the lines, and you have the template you want. This sounds like a good product; however, none of the local hobby and none of the art stores around here have even heard of this product.

Please advise where I can purchase this product as I would like to scratch-build an R/C plane.

EDWARD JACQUES JR.
Mesa, AZ

"See-Temp" is the name of the model company that sells the product you're seeking. They can be reached at (414) 246-3505. The material you're after is a heavy Mylar. You can find it at well-stocked arts-and-crafts stores because people doing tole painting also use it as a template material.

Another way to do templates when scratch-building is to use a thin drawing paper. Trace the part you're after and then, using a Post-It removable glue stick or a light spray of 3M-77, stick the template directly on the wood to be cut. I prefer the glue-stick method, as it's easy to remove the template once you're done. LM

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1998. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

RUSSKY WARBIRD

Steve Nickerson of Bakersfield, CA, built this Lavochkin La-5 from Gus Morfis plans. The 1/12-scale plane has a 32-inch wingspan and is powered by a .20-size engine. Steve finished his model in a late-War U.S.S.R. color scheme.

MOWIN' THE SKY

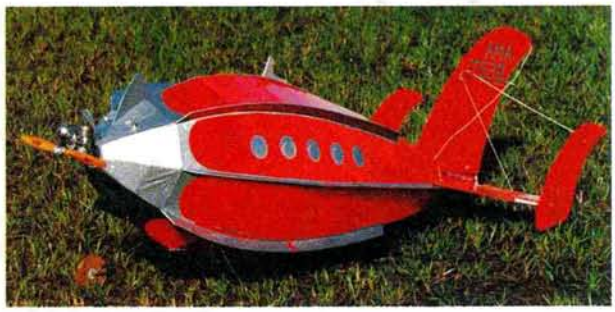
This unusual project is the handiwork of Don Ogren of Rochester, NY. Powered by a Royal .40, the mower platform is 26x26 inches and is made completely of foam, except for the balsa handlebar. Don writes, "The 'plane' has a lot of drag and weighs 5½ pounds, so power is necessary at all times. Landings are made at ¾ throttle and at a high angle of attack for slow touchdowns. This mower will loop and roll, so it's a real crowd pleaser."

OT TAURUS

Kirk Phaling of San Mateo, CA, found an old Top Flite Taurus kit still in its box at a garage sale. He built it like the original, adding only a servo on each aileron and, because he didn't have an OT engine, powered it with a new Thunder Tiger Pro .46. Kirk writes, "It is a dream to fly and never fails to elicit much comment from older flyers."

MARTIAN SPACESHIP

This Roy Clough design was built by Alexander Konopacki of Port St. Lucie, FL. Alexander powers the 4-pound model with a .40-size engine spinning an 11x6 prop and made the 3¾-inch wheels out of sponge beach shoes. He tells us that he has been building model airplanes since 1930 or so, and "this plane has no equal … it flies great."



TIME TRAVELER

Bob Morante of Brooklyn, NY, built this WACO out of a 1/6-scale Pica YMF-3 kit that he modified into a YMF-5. Using Bob Banka's Scale Model Research Documentation as a guide, he detailed the cockpits and dressed the model in Super Coverite, Rust-Oleum paint and MonoKote graphics. Bob says that this photo was taken at Gateway National Recreation Park, which is the former Bennett Field where many WACOs and similar '30s aircraft took off and landed.

BRITISH AUTOPLANE

Laddie Mikulasko of Dundas, Ontario, Canada, sent this photo of his own design model of a British lightplane. The 62-inch-span model weighs 2.5 pounds and features all balsa construction. Two geared Speed 400 motors in parallel running off an 8-1700mAh battery provide 15-minute flights.

GLOW BEE

Lon Turner of Cumming, GA, enlarged this Lazy Bee 25 percent from the original plans and added elliptical dihedral and a one-piece, molded nose section including windshield, motor mount, landing-gear axle slots and fuselage former 1. A 1972 Veco .19 provides power.

NESMITH COUGAR

This 1/4-scale model of a '60s homebuilt was designed and built by Jack Stubbs of Culver City, CA. Jack used Sport Aviation 3-views to come up with the plans for the 63-inch-span plane, and he covered it with MonoKote and Ultracote with Rust-Oleum paint. A K&B .61 2-stroke keeps this 7-pound, 6-ounce plane in the sky. Jack started modeling in 1935 and tells us that he's waiting until he's a little more proficient in flying R/C to bring the model to the field.

THE SPRUCE DEUCE

Jim McCurrach of North Vancouver, Canada, was inspired by the November '74 issue of *Model Airplane News* to build two STOL Machines, and in 1983, he decided to build the model pictured, a 200-percent-enlarged version. In September 1997, the model completed its 2,000th logged flight of minimum 10 minutes flight duration! The 8-foot-span model weighs 19 pounds on wheels or skis and 24 pounds on floats and is powered by a Quadra 35 (original powerplant was an O.S. Goldhead .60). Covering is sheer nylon with a dope finish.

PILATUS PC-9

Henry Bertoja of Vigodarzere, Padova, Italy, submitted this photo of his Pilatus PC-9 that he designed using CAD software. The 15-pound model has 80-inch-span foam-core wings, a built-up fuselage and is powered by an O.S. 1.08 engine. Henry writes, "I have never seen this plane scaled down for R/C flying and thought it was an unusual and challenging project. It took me almost two years from first thought to test flight to accomplish."

READERS' GALLERY

Keith Shaw with his pride and joy.

The Grumman F8F Bearcat had a reputation among Navy pilots of being the hottest ride around—justifiably so, as it held the climb record (10,000 feet in 94 seconds) well into the jet age. Some may wonder whether this aircraft is a viable candidate for an electric powered model, but Keith Shaw thought so. In fact, he insisted that his model be capable of demonstrating the Bearcat's awesome power display by jumping off the runway from a 3-point stance.

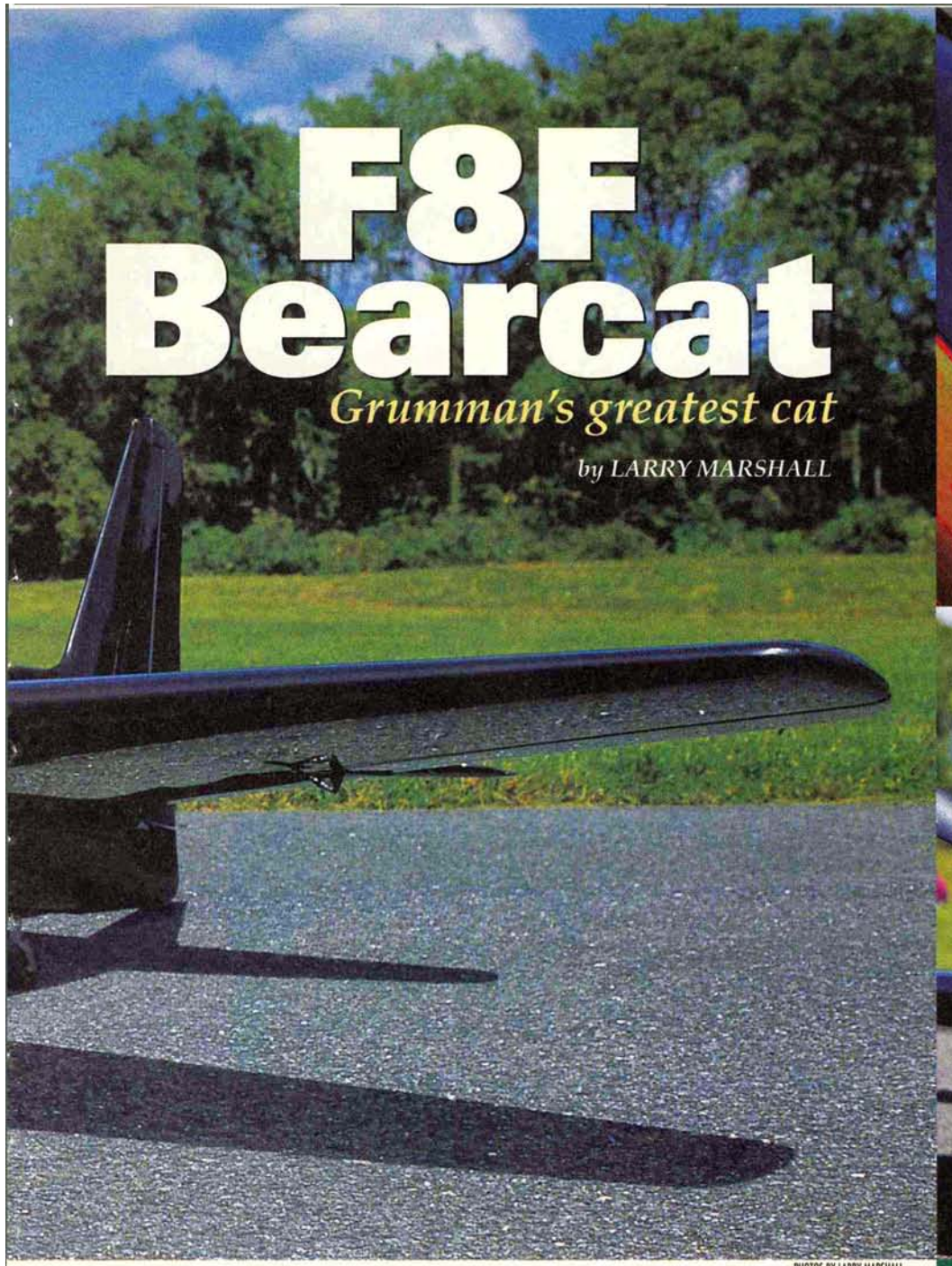
Keith is considered by many to be the "guru" of electric flight. While it's true that his building and flying skills are superb and that he has been on the cutting edge of electric flight for many years, I think the principal reason for the title "guru" is that Keith is also willing to tell you everything and anything he knows about our hobby and is an easy-going, really nice guy. And if you listen to Keith and think about what he says and does, you'll find that his approach to electric flight is to apply basic principles using first-class equipment in a manner that doesn't strain it to its limits. In spite of this, many of us still think Keith is something of a magician.

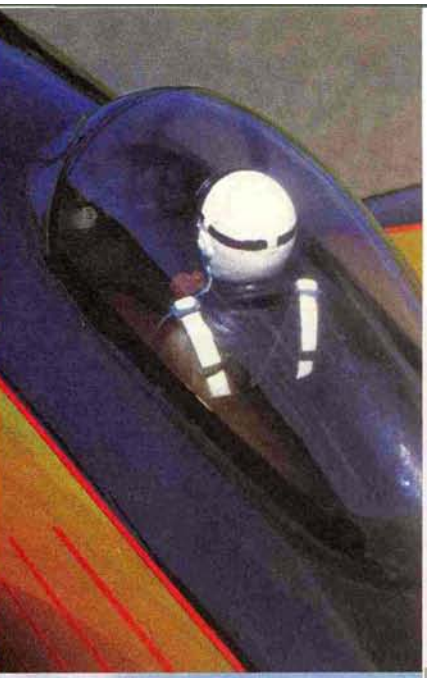
And so it is with his latest project, an 81-inch-wingspan, 15-pound Grumman F8F Bearcat. When electrics flyers see Keith point the nose of this aircraft upward, watching as he does repeated

F8F Bearcat

Grumman's greatest cat

by LARRY MARSHALL





PHOTOS BY LARRY MARSHALL

vertical rolls, they are impressed. When people who haven't seen high-performance electrics see it fly, they are amazed. And why not? Generally, planes this size are powered by large gas engines.

One of the things that's interesting when watching this electric Bearcat fly is the sound. Those who fly electrics don't generally talk about the sound of their planes, as there's not much of it. But anyone who has ever heard the prop noise of a full-size Bearcat will recognize the sound emanating from Keith's cat as it makes low passes over the runway. Without the engine noise of a large glow or gas engine, it's possible to hear the throbbing sounds coming from the 22x16 prop pushing air.

The Bearcat is covered with MonoKote, and the paint scheme comes from an airshow Bearcat of the '50s. Interestingly, Keith finds a use for the scale exhausts even in an electric airplane: he uses them to hide his on/off switch. Spring Air* retracts provide the proud stance. Power for this 15-pound plane comes from an AstroFlight FAI60 driving the 22x16 prop through a 3:1 ratio ModelAir-Tech* belt drive. The fuel tank consists of 32 Sanyo 1700SCR cells.

The secret to success with this plane may not be self-evident, but it lies in the fact that this 84-inch-wingspan, heavy-metal warbird weighs only 15 pounds in spite of its 4-pound battery load. While this plane is not fragile, it does lack all the vibration and fuel protection built into glow/gas models, and Keith crafts his designs carefully, using conventional balsa construction techniques.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

SPECIFICATIONS

Model: scratch-built Grumman Bearcat

Length: 64½ in.

Wingspan: 81 in.

Weight: 15 lb.

Motor System: AstroFlight FAI60, ModelAir-Tech 3:1 belt drive, Astro 204, 32 Sanyo 2000SCRC cells.

Prop: Zinger 22x16

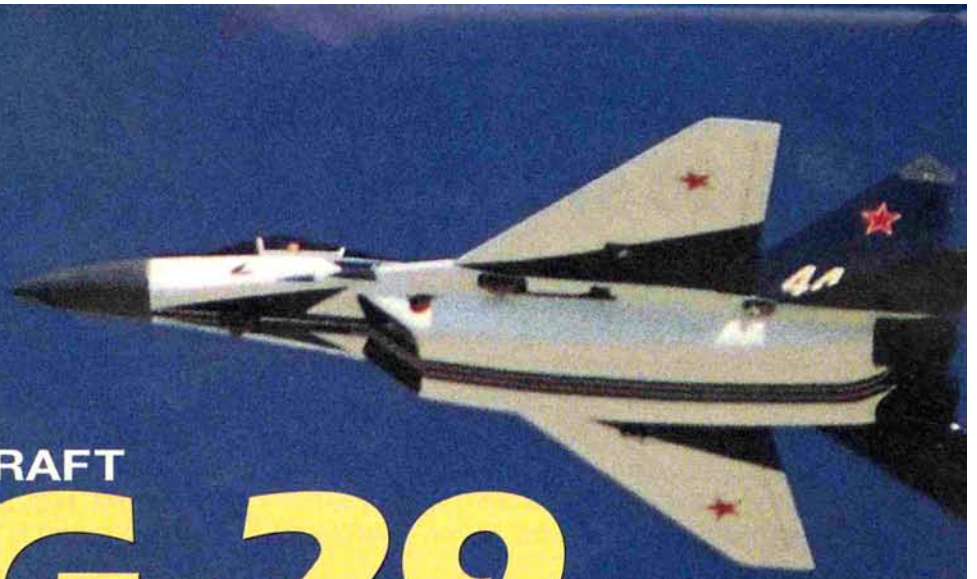
Retracts: Spring Air

Finish: MonoKote

Comments: the big prop, lower rpm and the absence of engine noise result in an awesome, Bearcat-like sound that simply has to be heard to be believed.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW



TOP GUN AIRCRAFT

MiG-29

by DAVID EICHSTEDT

MY LOVE AFFAIR WITH THE MiG-29 began during the summer of 1986. I was enduring the hot, sticky days of Plebe Summer at the U.S. Naval Academy, and the blockbuster hit "Top Gun" had just taken the silver screen by storm. "Dangerzone" echoed across the courtyards of Bancroft Hall, and it seemed as if *every* midshipman wanted to be a fighter pilot. The F-14 was the ultimate goal of those future aviators, but which aircraft would be their adversary?

Western intelligence was aware of a new Soviet aircraft that was radically different from any of its predecessors. Dubbed the Fulcrum, it was known to be a twin-engine, twin-tail plane roughly the size of the F-18, but that was about all they knew. Then, on July 1, 1986, the West got their first good look at the MiG-29 when six Fulcrums arrived at the Kuopio Rissala air base in Finland. I first saw the aircraft on the cover of *Aviation Week and Space Technology*, and it was love at first sight.

It's easy to admire the MiG-29 for its performance, but what's impressive about the Fulcrum is that it delivers all this in a relatively crude package. A good engineer is not one who can design an airplane from unobtainium, but one who works with what he has at his disposal to produce a functional design. At this the Russians excel. Apparently, so does Top Gun Aircraft Inc*.

PHOTOS BY DAVID EICHSTEDT UNLESS NOTED

Easy flyin' Fulcrum

THE KIT

The Top Gun MiG-29 Fulcrum is neither the next Scale Masters winner nor a 200mph speed demon. It's just a great-flying, good-looking, entry-level sport jet for the average modeler. Some of its features seem crude, such as the way the elevator and aileron servos protrude into the airflow. But these features make the model easy to maintain and, well, functional, just like the real MiG-29.

Before starting on the jet, I made a thorough study of the kit to understand the assembly sequence and construction details. As a result, I made a few changes to my kit. The instructions were better than many, but they still left a few ambiguities for the builder in some areas. I'll detail both the changes and the vague sections in this article.

CONSTRUCTION

• **Fuselage.** Fuselage construction is very simple, as there are only two bulkheads and a couple of plywood servo mounts to install. The main bulkhead serves as the mount for the fan, engine, landing gear and wing spars. I was a little confused about the location of this bulkhead, as it butts up against the aft side of the engine access hatch. This would be simple if there were not a large fillet in that same location. Rather than sanding a radius in the bulkhead, I simply glued it as far forward as possible, about 1/4 inch behind the hatch opening, and this worked out well. While on the subject of fillets, I found the fuselage to have several of them. They're used during fuselage layup to help the cloth lay smoothly in the mold. Unfortunately, they add a lot of weight, too, and I think Top Gun could have used smaller fillets to reduce the model's weight.

The landing-gear mounting pieces are 1/4-inch, laser-cut plywood, and they're pre-drilled for Spring Air* no. 101HD mains. I assembled them but didn't install them until wing construction was complete. Once the wings were finished, I used the wing spars to help get the landing-gear mount alignment just right.

I discovered two small, triangular, 1/4-inch plywood pieces that are mounted to the outboard side of the

The engine compartment. Note the remote needle valve (photo by John Kelly).

SPECIFICATIONS

Model: MiG-29 Fulcrum

Type: sport-scale jet

Manufacturer: Top Gun Aircraft Inc.

Wingspan: 55 in.

Length: 74 in.

Weight: 15 lb.

Wing area: approx. 890 sq. in.

Engine recommended: .91 to 1.05 ducted-fan engine or Byrojet fan unit

Engine used: O.S. .91 VR-DF

Muffler: Top Gun Aircraft Byron Pipe

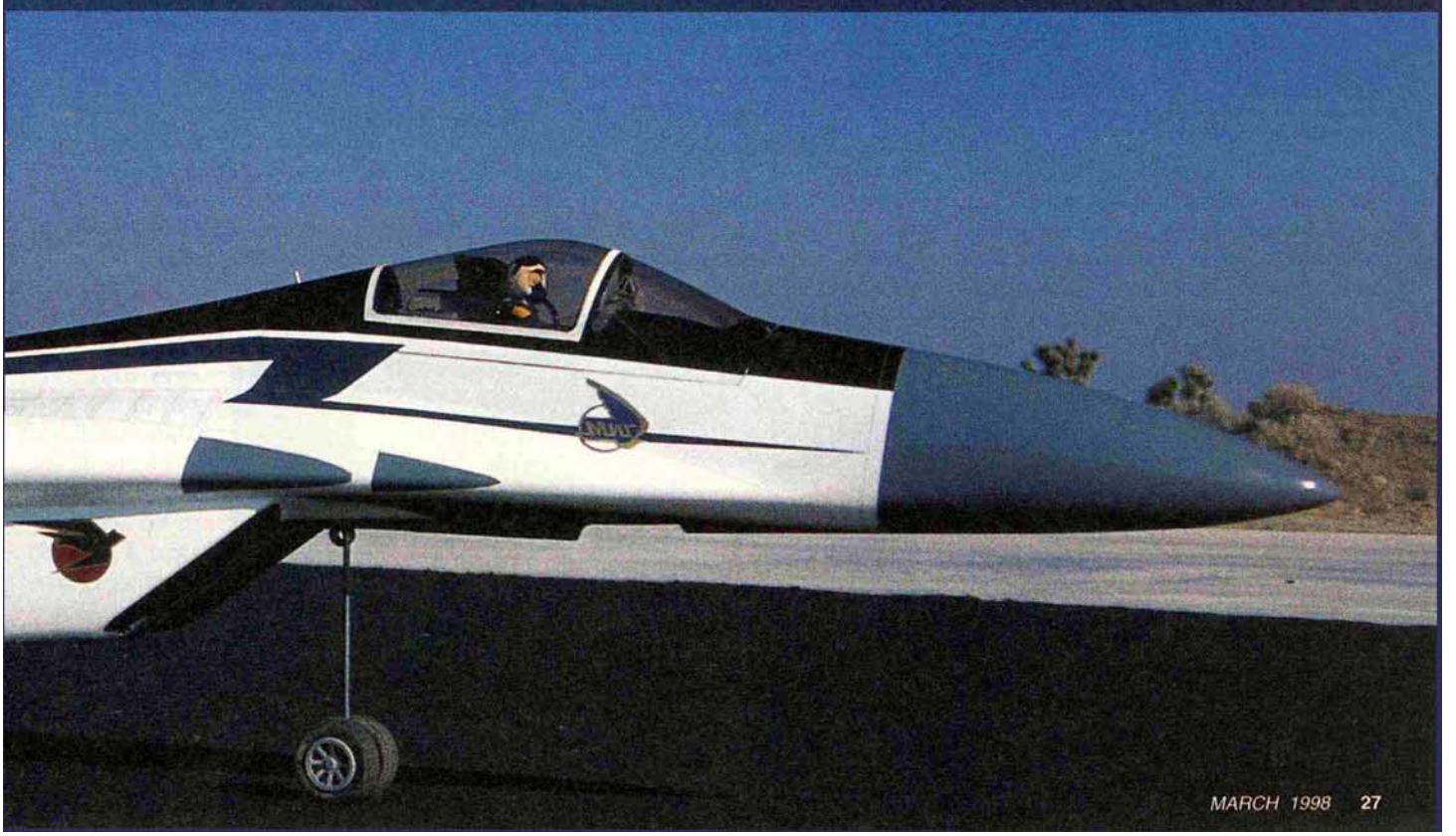
List Price: $389

Features: fiberglass fuselage, foam wing cores, sheet balsa empennage, clear canopy, full hardware package including Sullivan fuel tanks, laser-cut plywood bulkheads and landing gear mounts, sheet Lexan thrust tube, construction manual with photos.

Comments: very complete kit that's easy and relaxing to fly. It would make an excellent first jet.

Hits
- Complete hardware package.
- Accurate laser-cut parts.
- Rugged construction.
- Great looks.
- Smooth and stable in flight.
- Good overall value.

Misses
- Listed CG is too far forward.
- Instructions a little vague in places.
- No decals.
- Pre-drilled nose-gear mounting holes too high.
- Heavy fuselage.



FLIGHT PERFORMANCE

• Takeoff and landing

Takeoff roll on the dry lake bed is about 400 feet, equating to about 250 feet on concrete or asphalt. Full up-elevator is required for rotation, so be ready to haul back on the stick. Once in the air, the backpressure can be relaxed. Suck up the gear, and let a little speed and altitude build before making the first turn. Landing the MiG is just like landing a pattern plane. Make sure the gear are extended and the airspeed is bled off during the downwind leg. Through the base leg, maintain proper body attitude with the elevator and adjust the sink rate with throttle. At flare, add just enough power to slow the descent for a smooth landing. Beautiful!

• Low-speed performance

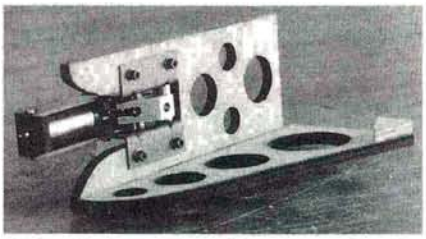
The MiG-29 has the potential for winning the slow-speed event at many contests. I couldn't get it to tip-stall. When it did stall, the break was clean and straight ahead with a rapid recovery. Usually, as the model was slowed without power, lift would be lost gradually and the sink rate would increase, much like a delta-wing model. Power is used to maintain altitude in this mode. Here's a fun part: the rudders are so effective that I was able to do rudder-only turns! I know I built a jet, but this thing can be flown like a Kadet Senior, if desired.

• High-speed performance

Top speed for this jet is around 120 to 130mph, which is slow for most jets but just right for a beginner jet. Aileron feel is markedly more sensitive at high speed, but that's to be expected. I noticed a few clicks of down trim were required at high speed, probably as a result of the extra trailing-edge up-incidence in the horizontal stabs. Throughout its speed range, the model exhibits excellent stability in all axes.

• Aerobatics

Aerobatics with the MiG are smooth and realistic, which is how I like them. My slow rolls were about 6 seconds long, but 8-second rolls could be done easily. Loops are surprisingly large, and vertical performance is quite respectable. Inverted flight is stable, and it requires just a touch of forward stick. Knife-edge is a little tough with all the roll coupling from the rudders. I didn't do any snapping maneuvers, but I'm sure they would be spectacular with the powerful rudders. All around, this is a fun and relaxing model.

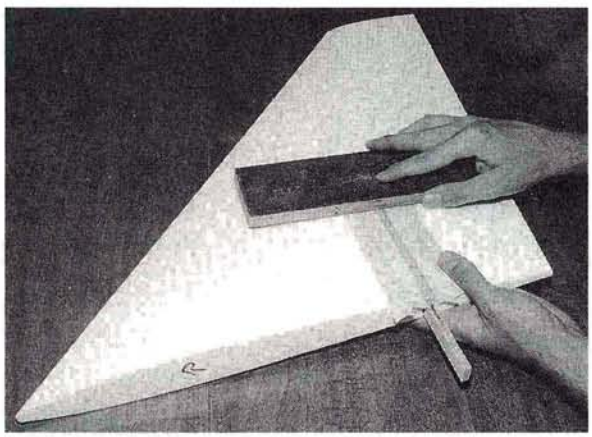


This is the left main landing-gear mount prior to installation. The small triangular doubler in the lower right-hand corner is essential for proper alignment of the gear, but it isn't mentioned in the instructions (photo by Joe Fowler).

degrees trailing-edge up-incidence, but the steps just didn't put them at that angle. I had to sand the bottom of the vertical stabilizers where the horizontals made contact until the right angle was achieved. I ended up with 1/4-inch trailing-edge up-incidence, which measured 2 degrees. The plane flew well at that setting.

Wing installation is easy, as the wing spar keys into the landing-gear mounts. I had a large gap between the root of the wing and the fuselage side, but only on the bottom. I installed a balsa root rib and sanded it as thin as possible, which resulted in a tighter, stronger glue joint. Yes, I said glue. Removable wings are optional with this kit and must be purchased separately. Since I have a full-size van to transport this beast, I glued the wings on, but I wish I hadn't. The MiG is a large model, and painting would have been much easier without the wings attached, never mind the transport issues. If you have anything less than a full-size van or pickup, take my advice: make the wings removable.

As you can see, I chose to paint my MiG in the color scheme of the Swifts, the Russian show team. I used both Dan Parsons* and K&B* glass cloth and K&B polyester finishing resin. After final assembly, the model was primed with K&B primer (wonderful stuff!) and painted with K&B Superpoxy (no longer available). Panel lines were drawn with a technical pen and gray India ink, and the decals were custom-made by Pro-Mark*. These decals are the dry-transfer type, and I highly recommend them for their ease of use and overall quality. Finally, the whole plane was clearcoated with an automotive lacquer.



The spar installation was modified to yield a stronger wing installation. Here you can see the 1/4-inch balsa spar caps and the masking tape shield used to protect the foam cores while sanding the caps flush with the surface (photo by Joe Fowler).

CONCLUSION

Although the instructions place the CG at 1 inch behind the forward edge of the engine access hatch, the final CG location came out to 2 1/4 to 2 1/2 inches behind that lip. That's quite a difference. A friend of mine from Georgia also had one of these kits; his CG was at 1 1/2 inches and he felt it needed to be moved back some more. So if you choose to build one, make sure you move the CG back! Set the elevator throw to 1 inch up and 3/4 inch down and the ailerons at 1/4 inch up and down, and you'll have an easy-flying model.

The Top Gun MiG-29 would make a fantastic first jet. Its construction is rugged, its flight characteristics are gentle, it looks great, and it's even affordable. Anyone who can handle a low-wing sport plane can handle this jet, provided he or she sticks with the right control throws. Experienced jet pilots might even enjoy the MiG-29 as a relaxing alternative to more demanding jet models. In either case, I'm sure you'll find this model to be a rewarding project.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

Keith Shaw wowed us with the incredible performance of his little Bear-Kitty powered by an Astro 020 brushless system.

KRC 18th Annual ELECTRIC FLY

by GUY FAWCETT

KRC—to most humans, a random grouping of letters; vaguely familiar to modelers not involved in electric-powered flight; a magical incantation to the increasing number of modelers taking on the challenges of e-power. For three days, on the third full weekend in September, the eyes of electric flyers from all over the world are focused here. KRC '97 was the 18th year for this growing mecca for turned-on modelers.

Greg Gimlick brought his Bristol M-1 powered by a MaxCim motor, 3.7:1 gearbox and 20 cells.

For me, having made a serious conversion to the ranks of electric modelers four years ago, seeing, hearing and tasting the event had been a building desire. Actually, seeing a video of the '92 KRC was part of my incentive to try e-power. Timing and a generous brother brought it together for me in 1997, and when *Model Airplane News* asked me if I could cover the event—heaven!

KRC (Keystone Radio Control Club of Eastern Pennsylvania) is the biggest electric meet in North America. Oddly enough, the club that puts on this show is *not* an electric-power-only group, but it does have several very active electric flyers. Anthony Assetto and Jim Wolstenholme managed the event, and in 1997, the club president, Jerry Rawson, happened to be a novice e-flyer.

Each year, the event has built on the success of the previous year and now draws hundreds of flyers and their models. In response to size restrictions at the Quakertown club field; the event had to move. The current Queen City Airport site—first used in 1996—is in Allentown, PA.

The move to the new site has made ROG takeoffs with small wheels or marginal power systems much easier due to the presence of a blacktop runway, but it has also changed every grass-field landing into a Russian roulette of hazard avoidance because they must be done on the far side of the runway on unkempt airport grass. Although the hard-surface runway is of some advantage, the majority of electrics flyers are still happier with a good stretch of smooth green carpet.

The detailing on Steven Stratt's Dornier D.I is superb.

Parking for over 800 vehicles is available, and an area adjacent to the runway is allocated to vendors displaying their wares. The airport management was more than pleased to welcome modelers again in 1997.

Electrics take Allentown by storm

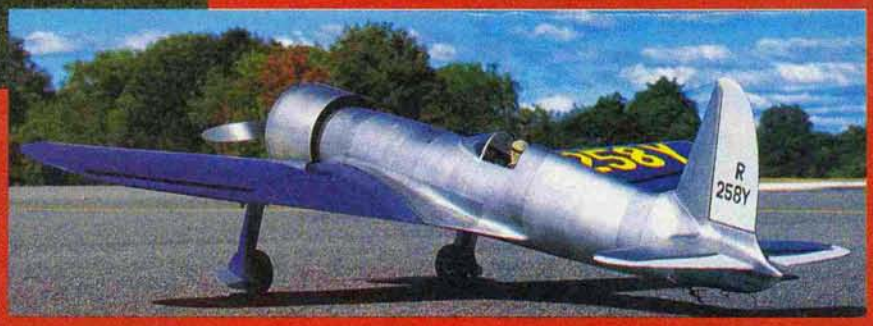
Dave Grife's Elextra, caught at the third point of a four-point roll.

Left to right: Lloyd Shultz designed this "should'a-been" homebuilt, and it flies great. He has an Astro 40G spinning an 18x10 prop, and it pulls this 81-inch-wingspan, 10.5-pound model along without even trying hard; Martin Irvine designed and built this Midget Mustang. While it didn't fly, it looks like a real tiger (sorry, couldn't resist). That is a scale paint scheme, by the way; Marc Thomson's Canadair CL-415 is a real showstopper. Powered by a couple of Astro 05s, it's far more aerobatic than its full-scale brethren; Mike Stewart is a long-time participant at KRC. He's flying this large Taylorcraft with an Astro Cobalt 90.

MASTER ELECTRICS FLYER

I met Dave Grife for the first time at the last KRC after having drooled over his models on videotapes and in magazine articles for years. Dave, it seems, is one of us mortals after all. Like a lot of modelers, he started building as a youngster, but other pursuits like girls and cars distracted him in his teens. But seven years ago, in his mid-twenties, and during a stressful time while working his way through dental school, he rediscovered modeling. Not one to take the easy course, he decided to teach himself how to fly and selected the Goldberg* Mirage 550 and proceeded to crash and repair his way to proficiency. Dave started with electric power and has never owned a wet-powered plane in his life. Being well known as an excellent pilot, he does get to fly other modelers' planes and sometimes envies the almost unlimited power available in internal combustion engines. His current air force is impressive.

Above: here's Dave Grife with his Elextra 300. This aerobat is powered by an AstroFlight geared 60 on 36-2000mAh cells turning an 18x14 prop at 6,000rpm and drawing 32 amps. For comparison, a US41 gas-burning engine with the same prop turns the same rpm. The plane is of built-up construction and is based on the Midwest kit.



Above: Hughes H-1 Racer; this 6.5-pound beauty has a wingspan of 65 inches and is powered by an Astro 40 with a Super Box drawing from 23 cells. The aircraft is covered in MonoKote and has the fuselage panels done with Innovative Model Products* Skinni-Dip to simulate the metal panels of the original. Dave drew the plans for this plane to 1/6.6 scale from the Paul Matt drawings.*

Left (top): Hawker Hurricane; the airplane is scratch-built from modified Brian Taylor plans. At 9 pounds, the plane is equipped with an Astro 40 with the new Super Box swinging a 16x12 on 24 cells, retractable landing gear from Robart and covered entirely in clear MonoKote*. Dave uses Monokote and Floquil model railroad paint extensively to great effect on most of his scale aircraft to provide a smooth finish and realistic coloring.*

Left (bottom): De Havilland Mosquito; built from Brian Taylor plans, this 81-inch-wingspan plane is powered by two Astro 40s with Super Boxes and 36 cells. The plane weighs in at 14 pounds and has seen use for the last four years. It's not easy to tell, but the Mossie had to be rebuilt after a major crash when one of its motors swallowed part of the armature.

Right: Travel Air Mystery Ship; this beautiful Thompson Trophy racer mounts a geared Astro 90 on 36 cells that turn a 22x14 prop at 4,700rpm. The model is true 1/4 scale and has a wingspan of 87 inches and weighs 18.5 pounds. The fuselage is fiberglass, and the wing is built up and fully sheeted.

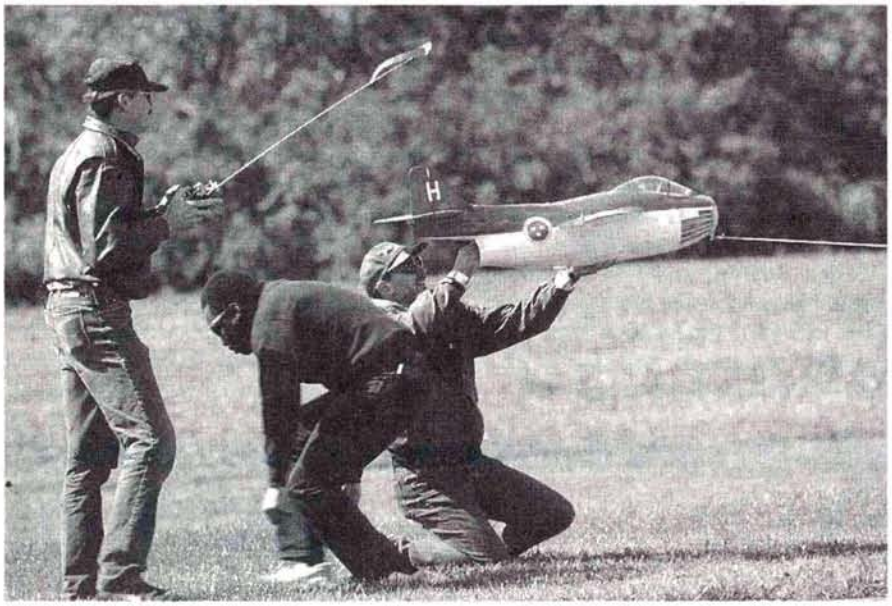
THE ADVENTURE BEGINS

I arrived in Allentown on Thursday night, after flying most of the day from Edmonton, Alberta, Canada. The size of KRC started to become apparent immediately. Like me, many modelers travel a great distance just to be part of the event. To people with even an inkling of what electric-powered flight is all about, an event of this magnitude is a magnet. For those who don't know anything about electrics, KRC is the place to learn and be amazed. The entire range of electric-flight possibilities is put on display. KRC is not confined to one aspect of electric flight but covers every aspect from miniature to giant, sport to scale and simple to intricate. The meet takes on the appearance of a festival, with vendors hawking their wares, brightly colored tents and awnings and a sky full of humming aircraft cavorting above throngs of interested spectators and pilots.

The weather last year was very interesting. Friday was one of those blue-sky days with temperatures one would expect at the high point of summer: no wind, hot and humid—quite a change for me. When I left Edmonton, there was a bit of snow on the ground. Saturday was just as hot, but a thick layer of cloud blocked any chance of seeing the sun and heralded the thunderstorm that passed through that evening. That small bit of bad weather was timed perfectly, and while it rained, the gathered throng feasted on a pig roast in a hangar at the airport. Sunday knocked many for a loop. Although the sun made an appearance through puffy white clouds, the temperature dropped by 30F and a cool nor'wester blew in from Canada (I had to bring more than a single aircraft didn't I?).

The planes are what make KRC an event, and there were plenty of those to see. Two hundred and thirty pilots were registered and a rough estimate would bring the number of planes close to 500. If you didn't see what you wanted to see, you probably didn't look hard enough. For me, highlights of the meet included (but were not limited to) some of these wonderful modelers and their creations.

I enjoyed the demonstration of raw power put on by Steve Neu and his F5B competition ship. The model is launched vertically, and its low passes down the runway are awe inspiring. The howl of 80 amps being converted to thrust seemed loud over the muted background noise of the other models. The climb rate is rocket-like; after a launch, the plane passes through 1,000 feet in a matter of seconds.



Walt Bubb built this Saab 29. It's powered by an Aveox 1409/3Y, 14-1800 cells and an Electrojet Technologies fan. Dave Baron, Bill Griggs and Russ Pribanic do the flying and launching honors.

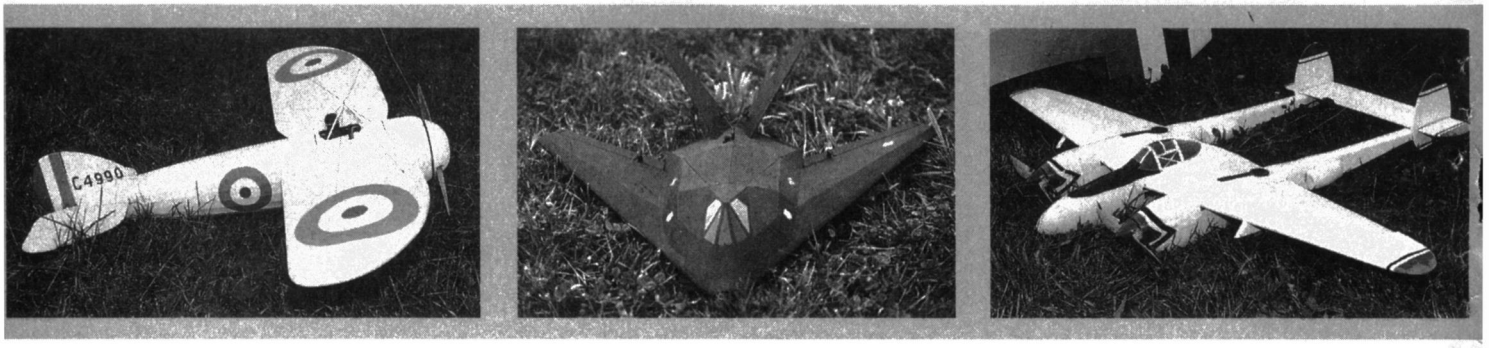
Jim Martin was there, his ever-smiling face greeting folks interested in Hobby Lobby products or simply talking electrics.

Steve uses the system's incredible climb performance to perform an aerial ballet punctuated by short bursts of noise as he goes vertical to continue the routine.

Jim Ryan's beautiful Hellcat was a great example of the popularity of Speed 400 aircraft. While watching it fly, someone unaware of its size would be forgiven for not realizing the wingspan is only 30 inches. Power is provided by a tiny Speed 400 motor costing just over $10 and running off seven inexpensive 600mAh AE cells—economy in motion!

Dave Grife evoked memories of the Battle of Britain with his veteran 72-inch Hawker Hurricane. The plane is complete with retracts and a nicely weathered paint job. I must say, this plane really impressed me with its smooth, fluid flight. I have watched scale model warbirds for more

This modified Goldberg Ultimate flew great.



years than I care to remember, and this model was really outstanding in its ability to duplicate scale flight.

The mock Speed 400 pylon race on Saturday had models whipping up and down the field; their quick, nimble shapes were almost a blur. If you had the need for speed, then watching these demons probably would satisfy it.

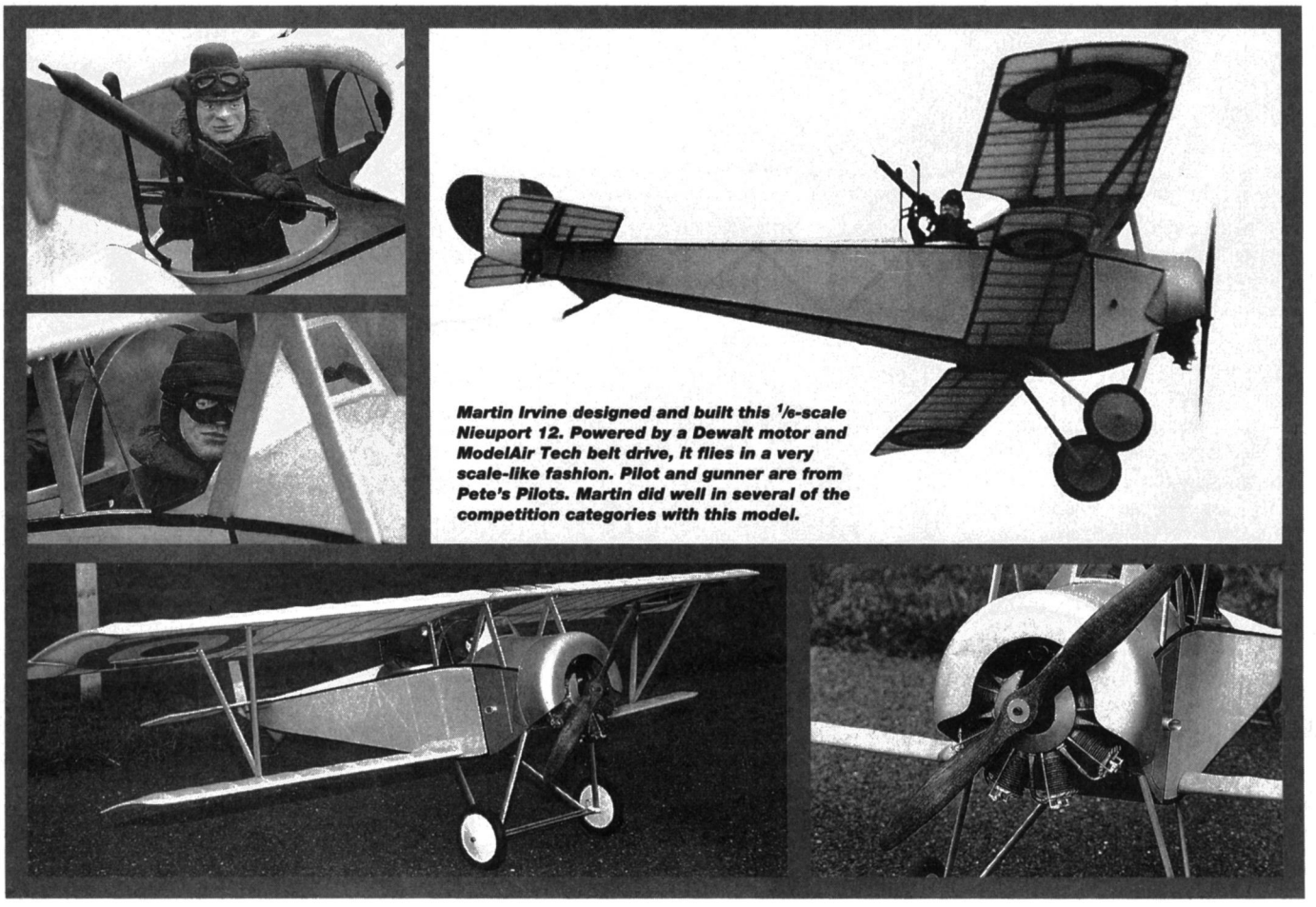
In marked contrast to the racers, powered gliders hunted for lift during the All Up Last Down event won by Karl Benson with a time of 1 hour, 36 minutes and 8 seconds.

Multi-engine aircraft were also well represented. One example that stuck in my mind was Dave Baron's massive four-engine B-17. This plane actually flew at scale speed (not something achieved very often) and really looked the part. The wingspan on this monster is 10.5 feet, and power is provided by four AstroFlight geared 05s and 32 cells. Covered with Coverite* Micafilm, it tips the scales at 18.75 pounds. The model was originally built by Joe Beshar, but Dave made him an offer he couldn't refuse.

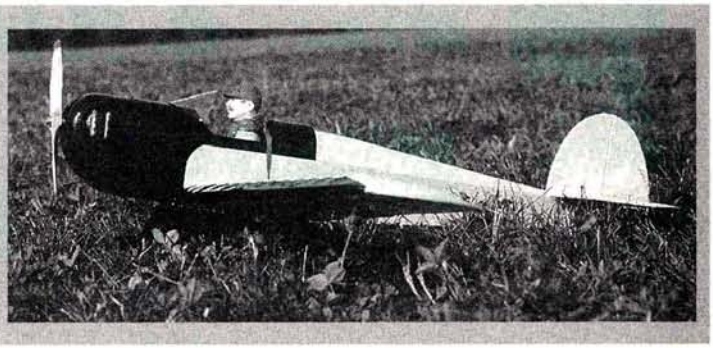
Keith Shaw made his traditional trek to the event and brought along part of his air force. The newest addition to the fleet demonstrated at this year's show was a 36-inch Bearcat powered by one of AstroFlight's new 020 brushless motors. Keith uses a 9x7 prop turning 7,500rpm to provide 8 minutes of very spirited aerobatics including multiple vertical rolls.

Above (left to right): Guy Fawcett's scratch-built Bristol M1 is powered by 8-600mAh cells, a 6V Speed 40, and a ModelAir Tech gearbox. Unfortunately, a thumb in the flying wires on launch resulted in its "last" flight. • Clay Howe built this Speed 400-powered F-117. • Tony Fiori is still flying his Kress Jets P-38. The batteries are held in clip on wing pods.

I saw an aerobatic maneuver this year that I have never seen before. To top it off, it was done with a most unlikely airframe—a Canadair CL-415 turbo-prop, water-bombing flying boat. Marc Thompson, a pilot for Air Canada, does the maneuver by starting something similar to the Russian Cobra performed by the Su-27. As the plane starts to pitch forward, he continues to rotate it around the



Martin Irvine designed and built this 1/6-scale Nieuport 12. Powered by a Dewalt motor and ModelAir Tech belt drive, it flies in a very scale-like fashion. Pilot and gunner are from Pete's Pilots. Martin did well in several of the competition categories with this model.



Above left: Greg Gimlick's OV-10, a Rich Uravitch design, was built from the Hangar Hobbies kit. Above right: Derek Woodward's Longster Whimpy is a real cutie. Powered by an Astro 05G, it's quite aerobatic.

axis of the wing by holding full down-elevator. In the air, the effect is such that you would swear the entire tail assembly is missing. The maneuver looks even stranger in a wind when the plane drifts 50 feet between rotations. My apologies to scale diehards, but the maneuver is just so cool. Marc told me that until he installed contra-rotating props, the plane could only do a Lomcevak; oh dear, how terrible! The CL-415 is powered by two AstroFlight geared 05s driving 11x7 props and uses 16 cells for a total weight of 6.75 pounds.

Don Belfort had a covey of airplanes with him; he definitely enjoys variety. He has everything from an ARF Bleriot ultra-light (imported by Hobby Lobby*) that flies at 4mph (fair weather or indoors only) to a scratch-built, bomb-dropping B-24 Liberator.

All flavors of ducted fans abounded; small sport planes generally appeared with their fan units mounted above a shoulder wing. Keith Shaw's aircraft stood out from the group, though; his plane is motivated by an AstroFlight brushless 05 motor turning a Wemotec 480 fan at around 30,000rpm in almost total silence. Keith put on quite an impressive series of flights and clearly demonstrated the performance attainable with the new generation of motors. Scale ships also appeared: a SAAB J-29 Tunan, a Heinkel 162 Salamander, a North American F-86 Sabre and a Grumman SA-3 Viking were but a few.

Strange machines also abounded at the event. The U.S. Air Force may have grounded all their F-117s on the weekend of KRC, but Clay Howe brought his Speed 400 version of the plane to do flybys in the capable hands of Dave Grife. Although Clay's model has a prop on its nose, when the throttle is advanced, it vanishes (the prop, not the airplane!), and the model becomes a stealth fighter in every way. The plane requires a bungee launch to get up to flying speed, but once there, it flies quite realistically. Unfortunately, the wind on Sunday forced a prototypical maneuver: dirt and aircraft mixed in the absence of air, and dire consequences resulted. Maybe they should have listened to the Air Force after all.

John Chapis, of Connie's Copies and Plans, brought this little bug. He calls it the Pollutionless Piglet, and it's powered by a Speed 400 motor. Like its larger brother, the Pollutionless Pig, it should prove quite popular with the electrics crowd.

Richard Flinchbaugh scratch-built this Italian Piaggio P136L from enlarged Scientext plans. The 7 3/4-pound amphibian has a 5-foot wingspan, two AstroFlight 15 motors and 16-1700mAh cells.

Martin Irvine cleaned up in the award department with a gorgeous Nieuport 12 taking the CD's choice, best multi-wing and second in the Scale event on Saturday. This beauty is powered by a DeWalt 14.4V drill motor matched up with a ModelAir Tech 3.6:1 belt-drive unit. Using 18 cells and a 16x8 prop, the plane attains a creditable 40mph. Martin has a wonderful crew of pilot and gunner produced by Pete's Pilots* of England manning the craft. The figures are molded in latex and come in a variety of scales, facial expressions and clothing styles chosen from a menu of possible combinations. Any scale modeler looking for a suitable addition to his cockpit can't go far wrong buying one of these works of art.

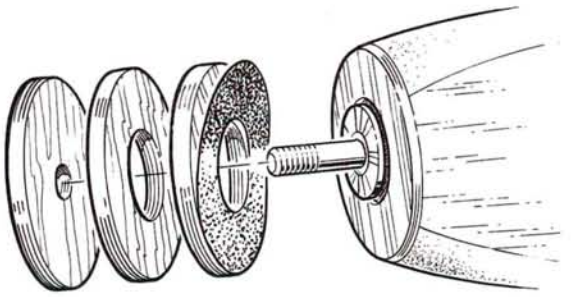
If people and knowledge are what you long to find, this event has all of the big names in electrics. Bob Boucher of AstroFlight showed off all his newest toys, including the 05-size brushless motor just entering production. Tom Hunt of ModelAir Tech brought a miniature air force of kit designs, gearboxes and belt drives galore. You could even talk to Keith Shaw—an acknowledged leader in electric flight—and see his amazing collection of scratch-built models. The list could go on and on. The truly wonderful thing about the whole event is that everyone is willing to talk and share his knowledge and time.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

Hints & KINKS

by JIM NEWMAN

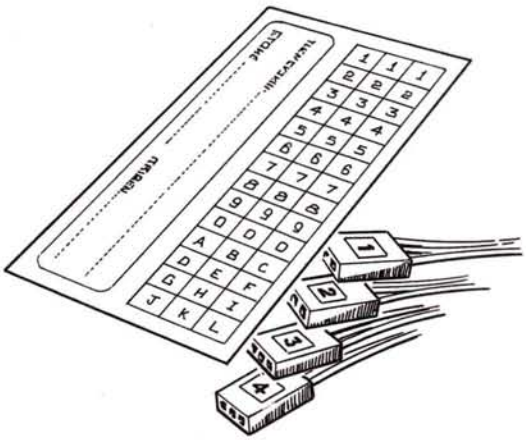
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



NOSE JOB

To achieve an equal air gap between the spinner and the cowl, cut three 1/4-inch (6mm) ply discs, glue them together, then face the last one with sandpaper. Rotate this tool on the propeller shaft, keeping the sandpaper firmly against the nose until it bottoms out on the propeller drive washer. Use washers on the shaft to achieve the desired gap.

Keith Sparks, Ft. Worth, TX



NUMBER'S UP

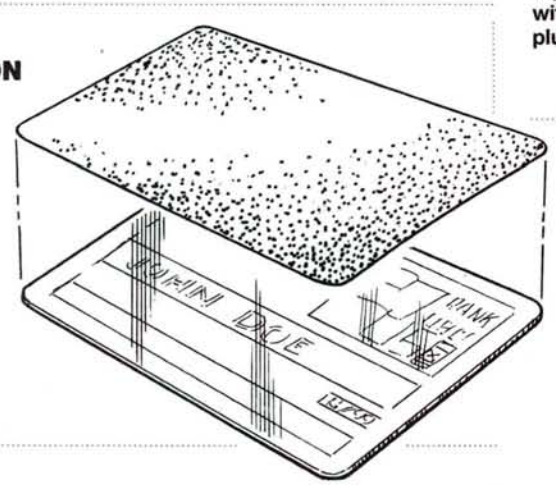
Use leftover self-adhesive numbers from videotapes to number each servo plug to correspond with the receiver sockets. This makes it easy to plug them in correctly after removal.

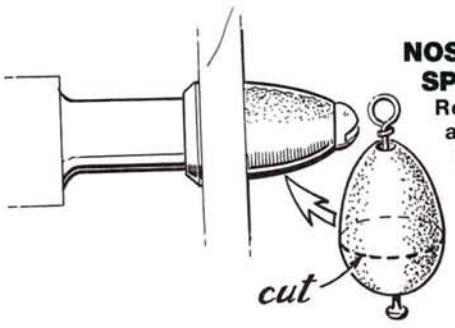
Marty Waldron, Mc Minnville, TN

SANDING ON CREDIT

Glue sandpaper to old credit cards. These can then be used as flexible sanding pads or cut into flexible files for those special jobs.

Don Thomson, Palm Harbor, FL





NOSE WEIGHT SPINNER

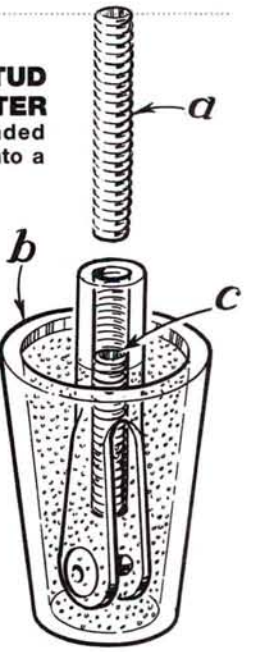
Remove the swivel from a lead fishing-line weight, cut as indicated, then drill it out to suit the propeller screw. This puts weight well forward where it is most needed.

Steve Fleetwood, Knoxville, TN

STUD INSERTER

Screw a stud (threaded rod) (a) all the way into a clevis as shown to act as a bottom stop. Put the clevis into an epoxy-filled plastic cap such as one from a CA bottle (b), and allow it to set solid. To insert a stud (c) into a clevis, screw the stud into the tool and use the inserter to screw the stud into Nyrod or another clevis as required. Then merely unscrew the inserter.

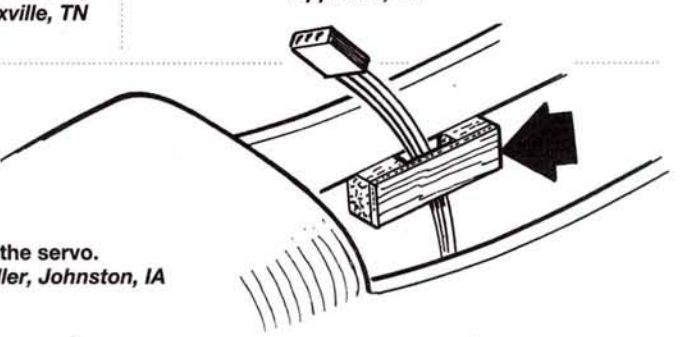
Myron Jackson, Appleton, WI

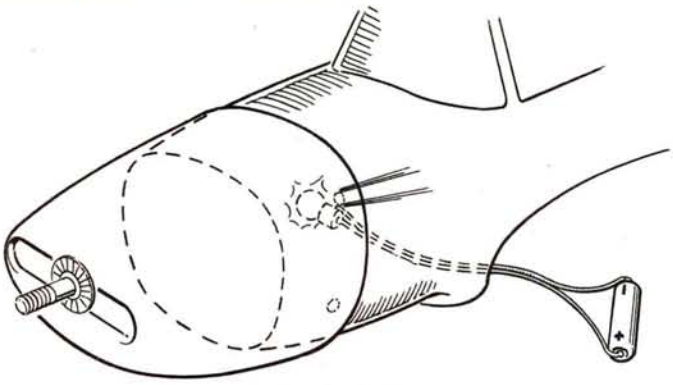


EASY PICKUP SERVO LEAD

This little balsa and ply bridge keeps the aileron servo lead up where it can be easily reached. The wide slot enables the plug to be pushed back down to remove the servo.

Terrence Miller, Johnston, IA

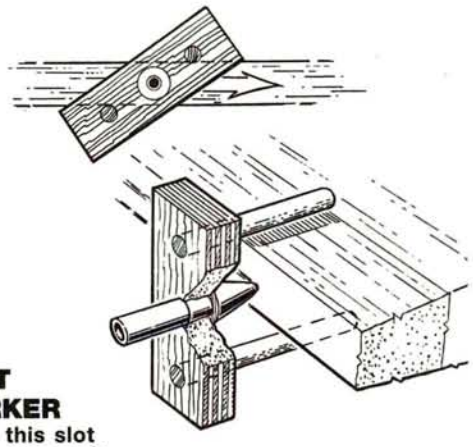




SPY LIGHT

To detect the position of the existing holes and nut plates when installing a new cowl, try this: solder a battery and bulb to some stiff wire, then insert the bulb into the back of the fuselage. The light shining through the holes onto the back of the plastic cowl will show where to drill.

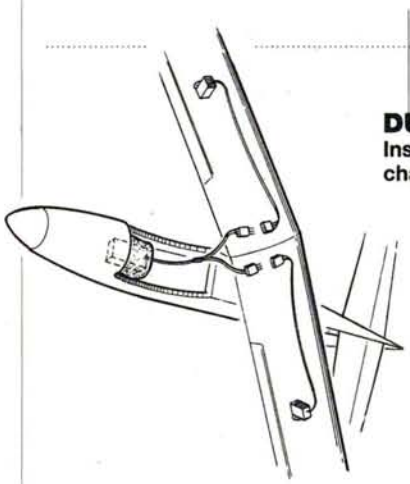
Clay Price, Weatherford, TX



5¢ SLOT MARKER

Make this slot marker out of ¼-inch (6mm) scrap ply and ⅛-inch (3mm) dowel. The cut-down ball-point pen refill leaves an easily seen ink line on the balsa.

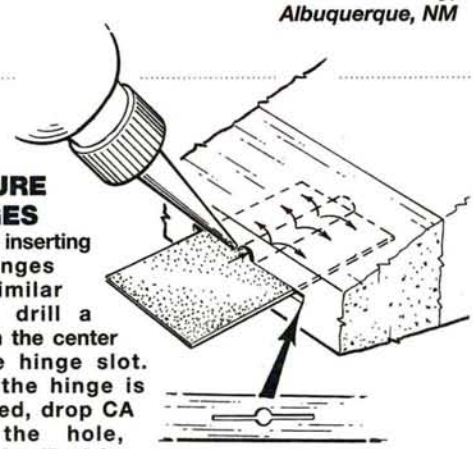
Dave Kovensky, Albuquerque, NM



DUAL SERVO PLUGS

Install a pair of Ernst or similar charging plugs into the top of the center section of the wing so that when you remove the wing, you don't need to unplug the Y-harness from the receiver. It is much easier to unplug each leg of the harness directly from the top of the wing.

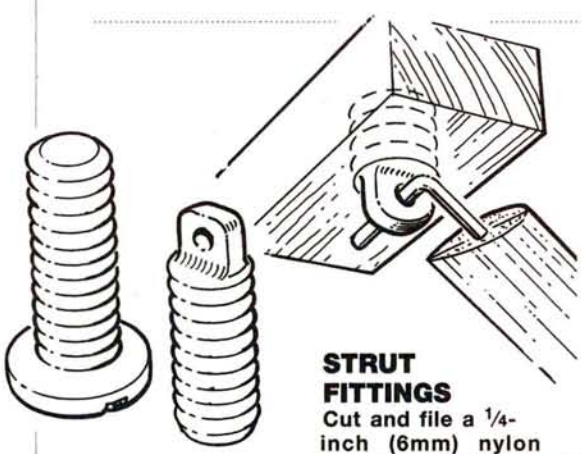
Thomas Stephan, Phillipsburg, NJ



SECURE HINGES

Before inserting EZ hinges (or similar type), drill a hole in the center of the hinge slot. After the hinge is inserted, drop CA into the hole, where it will wick out over the hinge and create a more secure bond over a larger area.

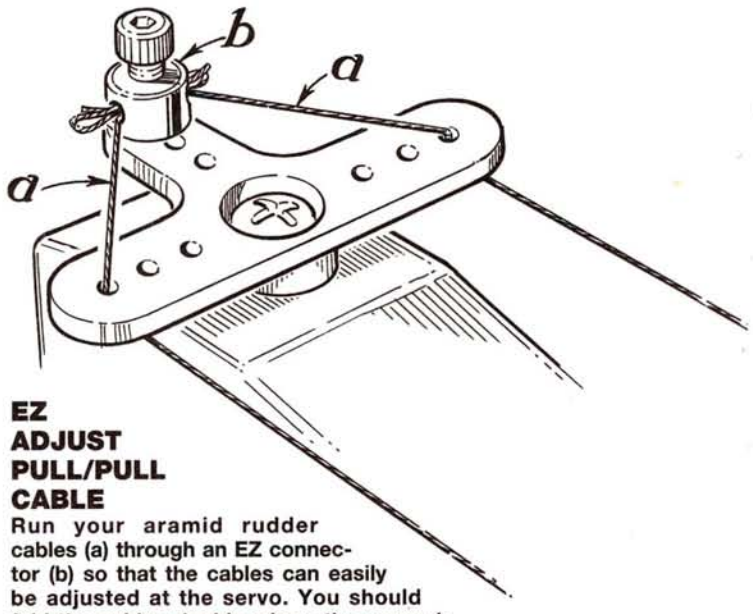
Ron Fikes, Palo Alto, CA



STRUT FITTINGS

Cut and file a ¼-inch (6mm) nylon screw to make this neat strut attachment fitting. Screw the unit into a tapped hardwood block that is securely built into the wing structure. Broken fittings are easily replaced.

Larry Sartor, Bartlesville, OK



EZ ADJUST PULL/PULL CABLE

Run your aramid rudder cables (a) through an EZ connector (b) so that the cables can easily be adjusted at the servo. You should fold the cables double where the screw is clamped onto them.

N. Froude, Fairlie, New Zealand

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

HOBBY SHACK

Air Master 40T

by GREG VOGEL

Conquer the skies!

WHEN THE big "40" comes up in conversation, many people immediately think of middle age. Well, Hobby Shack* has a totally different outlook on the subject of "40." It's the Air Master 40T to be exact, and this plane is anything but old. As one of the younger generation, I think in terms of what's "cool" and, truthfully, some of the old warbirds just don't put the air under my wings. Hey, it's the '90s; I want to see some sharp colors! Now this is where the Air Master 40T trainer comes in. This model is a real looker straight out of the box. I guess there are some others out there with good taste after all.

THE KIT

The Air Master 40T is an ARF kit, and you know that means little building time and you'll be in the air quickly. The 40T comes with all of the hardware needed and a thorough instruction booklet. Wheels, fuel tank, screws and nuts, a tree of nylon control-surface pieces, a wheel wire and even the engine mount that's already attached are standard equipment. The roomy balsa fuselage is assembled and open on top for easy radio installation. It's then sealed off with an ABS turtle deck. A two-piece formed cowl enhances the model's looks. The wing and tail feathers are also built-up balsa.

THE WING

I like things easy, and I don't think it gets any easier than an ARF trainer wing. Mix up a batch of 30-minute epoxy and find the wing joiners. Apply a coat of epoxy to two of the joiners—not too much now, this isn't a peanut-butter sandwich. Stick the third joiner cutout in the center of the joiners you just epoxied, and then clamp them. While this was curing, I cheated and moved ahead to the aileron installation. Slide the ailerons out, and coat the slots with the same batch of epoxy as you used before (that is, if you completed the previous step quickly and the epoxy hasn't cured). Rough up the hinge tongues and put a drop of oil on the hinge itself in case epoxy gets on it. Then slide everything back into place.

A few hours later, I epoxied the wing halves together with the joiner in the center. Make sure they go together evenly, and if necessary, use some tape to hold them. When the wing had dried, I put the aileron servo tray together, measured and cut a hole in the wing and CA'd the tray into place. To finish the wing, install the servo and pushrod linkages and stick on the stylish yellow Mylar tape to cover the seam.

TAIL-SURFACE ASSEMBLIES

Now the wing is together, we can properly install the horizontal stabilizer. Get a nice big white towel to work on; come on now, you don't want to scratch the finish on this purty plane, do you? Slide the dowels temporarily into place, and rubber-band the wing to the plane. Measure to find the center of the stabilizer surface and where it will sit on the fuselage. Then measure from wingtips to stab tips to make sure the distance on each side is the same. When everything is lined up, peel away the covering where the stab touches the fuselage and epoxy them together (T-pins are great to hold everything in place). Use the same procedure for the vertical stab. Repeat the same steps as you used to glue in the rudder and elevator as you did with the ailerons.

FUSELAGE

The first item of business was to put a thin layer of epoxy in the fuel-tank area to protect against spills. Pop the fuel-tank pieces together; when this has been finished, I recommend that you attach about 6 inches of fuel tubing to the exit tubes and then feed the tubes through the firewall and insert the tank. It's easier to put the line on now than when the instructions suggest (excess tubing can be cut off later).

Now test-fit and glue in the radio tray. I had to do some minor surgery to achieve a snug fit. Slap on a generous amount of CA here; this tray holds

SPECIFICATIONS

Name: Air Master 40T
Manufacturer: Hobby Shack
Type: .40-size trainer
Wingspan: 61 in.
Length: 50 in.
Wing area: 675 sq. in.
Airfoil: flat bottom
Weight: 5.2 lb.
Radio req'd: 4-channel
Engine req'd: .40 to .53
Engine used: Magnum .40
Prop used: Master Airscrew 10x6
Street price: $90

Features: all balsa and ply construction; ABS turtle deck, cowl and wingtips; hardware, wheels, landing-gear wire, fuel tank, engine mount; photo-illustrated instructions; five-color graphic covering.

Comments: I prefer to build my own plane from kit form, so I know it's built correctly, but after inspecting the Air Master 40T, I could tell this was a high-quality kit and I wouldn't have to worry. Finishing this kit was a breeze.

Hits
- Excellent-quality material.
- Affordable.
- Fast build.
- Highly visible covering.

Misses
- Z-bends used on both ends of the same pushrod.
- Beginners who don't have a Moto-tool may find it difficult to cut out the cowl.

PHOTOS BY LARRY MARSHALL

FLIGHT PERFORMANCE

• Takeoff and landing

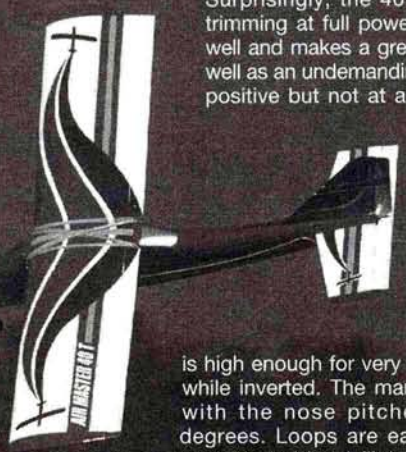
The Air Master 40T is very easy to fly; this is evident as soon as you advance the throttle and begin to taxi. The model rolls effortlessly with only a little thrust. Steering is very good with the tricycle landing gear. Very little rudder correction is needed to track straight down the runway, and on the first flight, the model was in the air before I pulled back on the stick—nice surprise. A little down-trim and some left aileron had the 40T climbing to altitude hands-off!

Landings are just as easy as takeoffs, but you do need to keep in a bit of power. The model does have a fair amount of drag (no different from any other trainer) and will stall if the nose is not kept down. At about ¼ throttle, the model descends nicely and has enough speed for a gentle flare before touchdown. Rollout is undemanding, and you shouldn't break a lot of props with this one.

• General flight characteristics

Anything below ¼ throttle enters the slow-flight region for the 40T. A slight re-trimming to prevent the nose from dropping is required and allows the model to fly without losing altitude. You do have to work at maintaining altitude, however, as any turns or banks result in a small loss of altitude. Comfortable cruise speed is at about ⅓ throttle.

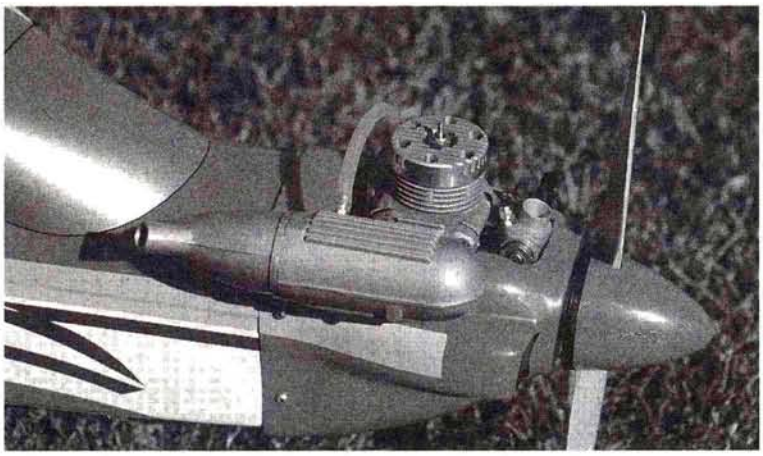
The only way this model will go fast is with full throttle. Surprisingly, the 40T requires very little re-trimming at full power. The model tracks very well and makes a great general sport model as well as an undemanding trainer. Roll response is positive but not at all uncomfortable. On low rates for the elevator and high rates for ailerons, the Air Master 40T will satisfy anyone's need for a solid performance.



• Aerobatics

At full power, rolls are fairly tight and the rate is high enough for very little down to be required while inverted. The maneuver should be started with the nose pitched up about 20 to 25 degrees. Loops are easily accomplished from straight and level flight, but as the diameter of the loops is increased, so, too, is the need for a shallow dive prior to the maneuver. Set up as a trainer, the model will not enter a true spin or do anything resembling a snap-roll; as it's a trainer, this is not a miss.

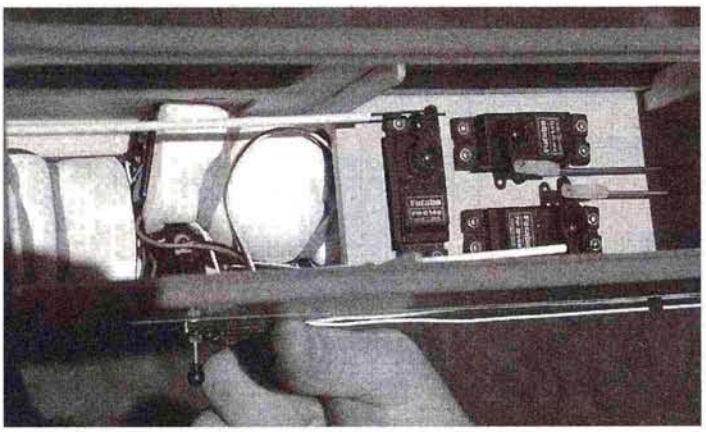
If more performance is desired after you've learned the basics, increasing the control throws and shifting the CG aft a bit will improve the model's maneuverability. Out of the box, however, the 40T is a solid platform for training the novice pilot.



A Magnum .40 powers the Air Master nicely.

your control-surface servos. Placement of the landing and nose gear is the next step. It's relatively simple; just read the instructions and look at the photo!

Time to slide in the pushrods. The 40T uses several rods for control. Smaller rods with Z-bends control the nose gear and the throttle, and the elevator and rudder use dowels with adjustable clevises at one end. With the exception of the rudder rod, the pushrods are easy to install. The turtle deck needs to be glued and taped into place, and then the rudder pushrod is installed. It may take some time to manipulate it into position and, no, talking nicely to it doesn't help! Th pushrods are attached to the control surfaces with the supplied horns. I then put on the windshield decals (sorry, I couldn't wait any longer!).



There's more than enough room in the fuselage for the three Futaba S-148 servos, receiver, battery and fuel tank.

ENGINE AND RADIO

A Magnum* .40 was my engine of choice. Before I stuck it in the nose of the plane, I put a couple of tanks of fuel through it on a test stand. I strapped it into the mount in the fuselage and hooked it to the throttle linkage via a Z-bend. Another Z-bend goes into the servo horn at the other end of the throttle, so make sure the rod is the right size before you bend it. Cut the cowl to fit over the engine, then tighten up the propeller and screw on the spinner. Pushrod keepers hold the other linkages in the other horns. I used Futaba* S-148 servos and the rest of the gear that came with the 6-channel Futaba Conquest radio system.

FINAL THOUGHTS

When this plane is all together, it's almost too cool to fly. You may find my excitement for a trainer plane a little odd, but I'm pleased that someone has at last come out with an eye-catching model that's also an excellent trainer. I don't think I would be wrong in saying that a stylish plane such as this might bring a bunch of new flying hopefuls into the hobby of R/C flight. The Hobby Shack 40T has heightened my enthusiasm for learning to become a better R/C pilot.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.* ✦

Scale aerobatic shootout

IMAC National Championships

by DANIEL WOLANSKI

DURING THE LATE '80s AND EARLY '90s, the location and results of the IMAC National Championships went pretty much unnoticed. After all, IMAC was still in its adolescence, and other mature events like pattern and the TOC (Tournament of Champions) dominated media coverage. But nothing remains constant, and it was only a matter of time before the pendulum began to swing toward IMAC events nationwide. IMAC's new leaders realized the popularity growth and began to promote IMAC more aggressively. Using tools like the Internet and a professionally published newsletter, IMAC has finally achieved the prestige and popularity once dominated by pattern. So how do you up the ante? Easy: publicize, promote and bring together the nation's best pilots at one contest over a holiday weekend and call it, "The IMAC National Championship."

Darrow Watts' beautiful "stick airplane" for flying Unknowns.

PHOTOS BY DANIEL WOLANSKI

This year's IMAC National Championship was held in Morgan Hill, CA, in conjunction with AMA Expo '97. Contestants drove more than a thousand miles each way to get the opportunity to compete with the best IMAC pilots in the nation. Planning for the event began well over a year in advance by contest director Amir Nashati and the Santa Clara County Model Aircraft Skypark club. This was the best-run contest that I have been to in a very long time, and the 60x520-foot paved runway, complete with paved pits and full-service snack bar, added to the enjoyable country-club atmosphere.

Darrow Watt discussing inverted maneuver with Ryan and Harry.

THE COMPETITION

As dawn broke Saturday morning before the contest, pilots began to arrive in droves. As 39 pilots assembled their planes, one thing became immediately apparent: everyone had a *large* airplane. I began to wonder whether I was at a rally of the giants and not an IMAC contest. After all, IMAC doesn't have a minimum aircraft size requirement. As I walked up and down the pits to size up my competition, I soon realized that my ¼-scale Extra 260 would be the smallest plane in the Advanced class! The 74-inch-span plane couldn't compare to the 100-inch-plus size of the 35% machines. I have always believed that smooth thumbs matter more than a larger plane, but I really didn't want to test my theory at a national championship!

We assembled for a pilots' meeting to review the rules and scoring. Amir reviewed the sign-up list and gave us the tally of contestants. There were 20 Sportsman pilots, 10 Advanced and 9 Unlimited. We also reviewed the scoring format and discussed the controversial topic of gyros. The use of gyros is not forbidden under the current AMA rules. Amir used his CD power, however, to ban their use. Bill Hempel Jr. apparently never received notice of this ban and showed up a few days before the contest with gyros installed. Bill attempted to convince Amir on Friday that their use did not give him an advantage, so Bill let Amir fly his Edge 540 with the gyros on and off so that he could make his decision based on experience. Amir flew the plane and concluded that the gyros damped several maneuvers, including stall turns and snap exits. Because these elements are vital to scoring, gyros would not be allowed. Amir reconfirmed his position on gyros at the meeting and asked Bill to unplug them. Bill

Harry Taylor starts son Ryan's airplane.

Bill Hempel Jr. poses with his 3W-70 powered 36% Aeroworks Edge 540.

Ken Zierman built and flew this 35% PMP Extra 260.

Ken Gregory with his 35% PMP Extra 260.

Doug Cronkhite flew his Midwest Giles 202 in Freestyle.

Ryan Taylor poses with his 36% Aeroworks Edge 540.

politely obliged and the contest began at 10:30 a.m.

The contest started with the Sportsman pilots split up at the two flightlines. All pilots were instructed to fly through the sequence two times while in the air. Advanced and Unlimited shared the sky during the afternoon. The day continued by switching judges and flightlines to ensure a balanced score. By 6:30 p.m. we had five scored flights, and all of the attention was on scorekeeper Brian Nelson. Northwest regional champion Mike Kuper led the Sportsman class with his 70-inch-span Ohio Extra 300S. Trailing Mike were Tom Smith from Edmonton, Canada, and Chris Fouquet from San Francisco, CA, each with 33% airplanes. In Advanced, I was in first place with my 25% Precision Model Products (PMP) Extra 260, followed by two local contestants, Fred Weaver and Ken Zierman, each flying a 35% PMP Extra 260.

Jim Spurlock stick-flies the Unknowns with friends.

Unlimited seemed to be the Ken Gregory show. Ken had a commanding lead over second-place Bill Hempel Jr. and third-place Ryan Taylor. Ken flew a 35% PMP Extra 260 while both Bill and Ryan flew the new 36% Aeroworks Edge 540. At the end of the day, Saturday, Amir handed out the Unknown patterns for each class and instructed that no one practice them. After receiving the Unknowns, it was clear that these would be the breaking point of the contest. These were the most difficult I have ever seen. My personal goal was to get a score on every maneuver—no zeros. Mike Kuper and I "stick flew" our respective patterns all night in our hotel room until we couldn't think clearly. Tomorrow would determine the national champion.

WINDS OF CHANGE

Sunday began the winds of change in the Advanced and Unlimited classes. The difficulty of the Unknowns really separated the scores among the more experienced pilots. In Sportsman, leader Mike Kuper flew a very smooth routine with the exception of rolling the wrong way on a humpty. Mike got a zero on the maneuver but still won the round. Dennis Welty from Boring, OR, flew a solid round and jumped from sixth place into second, bumping Tom and Chris down a notch. In Advanced, I failed to meet my goal and zeroed a two-turn spin by performing the maneuver out of the box. This opened the door for Ken to take over first with a very solid flight. In Unlimited, Bill Hempel Jr. flew the Unknown as if he had been flying it all year long. Ken

Sportsman pilots show that it doesn't take a huge plane to compete.

1997 IMAC National Champions (left to right): Mike Kuper, Sportman; Bill Hempel Jr., Unlimited; Ken Zierman, Advanced.

Gregory stepped up to the plate and appeared to be hitting a homer when something went wrong. He missed a half roll near the end of his sequence because he couldn't hear his caller over an engine in the pits. Ken didn't realize his mistake until three maneuvers later and zeroed all three. Ken lost 150 points and the lead all in less than 10 seconds. Ryan Taylor held on to third with a very nice flight.

After the Unknowns, we flew one more round of Knowns. Everyone who had fallen a place or two tried desperately to play catch-up, but the new leaders would not succumb. Mike Kuper in Sportsman was the only flyer who maintained a steady lead going into Sunday. For his efforts, Mike Kuper went home the national champion in Sportsman. Advanced was very close, but neither I nor Fred Weaver could catch Ken Zierman's last two scores. Ken's performance was awarded the Advanced National Championship. In Unlimited, Ken Gregory could not make up the deficit and Bill Hempel Jr. pulled a rabbit out of his hat by winning the Unlimited National Championship. Bill now moves on to the Masters in Greenville, SC, and indicated to me that his personal goal is to compete in the Tournament of Champions.

1997 IMAC NATIONAL CHAMPIONSHIPS FINAL STANDINGS

The Winning Combinations

NAME	SCORE	PLANE	ENGINE	PROP	RADIO
SPORTSMAN (20 pilots total)					
1. Mike Kuper	78.9%	Ohio Extra 300S	YS 1.20NC	APC	Futaba 8UAP
2. Dennis Welty	76.1%	⅓ Scale Godfrey Laser	3W-70	Menz	Futaba 8UAP
3. Tom Smith	75.6%	⅓ Scale Godfrey Laser	3W-70	Menz	Futaba 9ZAP
4. Chris Fouquet	74.6%	⅓ Scale Ace Extra 230	G-62	Menz	Futaba 8UAP
5 Damon Parker	72.9%	30% Godfrey Extra	3W-70	Menz	Airtronics Stylus
ADVANCED (10 pilots total)					
1. Ken Zierman	81.6%	35% PMP Extra 260	3W-70	Menz	Airtronics Stylus
2. Fred Weaver	80.9%	35% PMP Extra 260	3W-70	Menz	Airtronics Stylus
3. Dan Wolanski	79.8%	25% PMP Extra 260	YS 1.20 NC	APC	Futaba 8UAP
4. Harry Taylor	76.6%	36% Aeroworks Edge 540	3W-80	Menz	JR 10 SX II
5. Joe DeRenzi	75.9%	33% Lanier Extra 300S	3W-70	Menz	Futaba 8UAP
UNLIMITED (9 pilots total)					
1. Bill Hempel Jr.	82.2%	36% Aeroworks Edge 540	3W-70	Menz	Futaba 9ZAP
2. Ken Gregory	79.6%	35% PMP Extra 260	3W-70	Menz	Airtronics Stylus
3. Ryan Taylor	79.1%	36% Aeroworks Edge 540	3W-80	Menz	JR 10 SX II
4. Doug Cronkhite	75.8%	36% Aeroworks Edge 540	3W-80	Menz	JR 10 SX II
5. Darrow Watt	74.4%	35% PMP Extra 260	3W-70	Menz	Airtronics Stylus

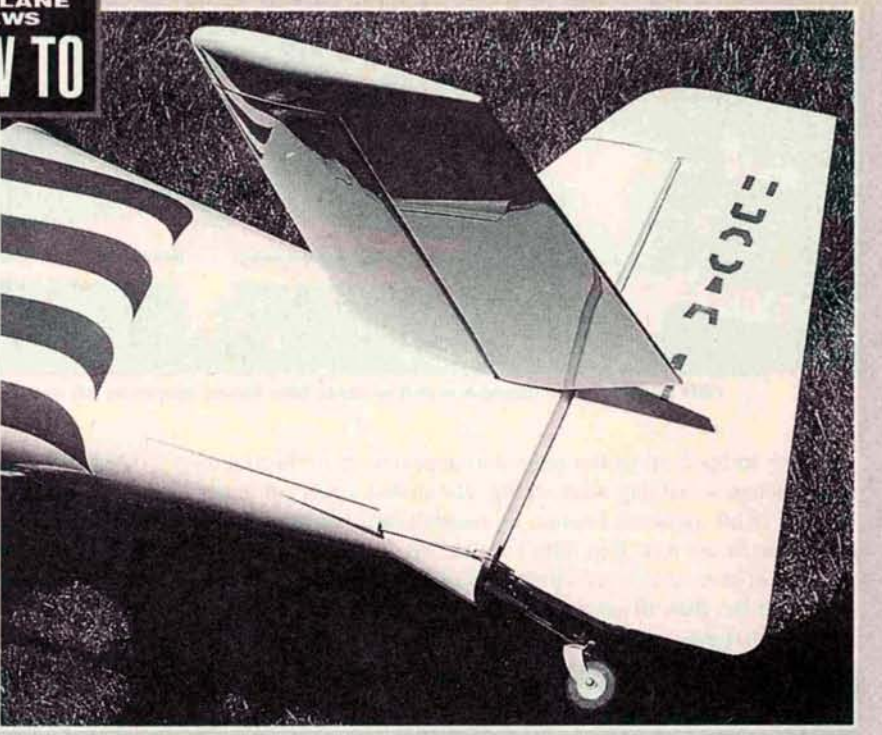
All of the people who received a trophy. National Champions (left to right): front row—Ken Zierman, Bill Hempel Jr., Mike Kuper; second row—Fred Weaver, Ryan Taylor, Tom Smith, Dennis Welty, Dan Wolanski, Ken Gregory; last row—Doug Cronkhite.

GOING HOME

I look forward to this event every year and realize that it takes more than planning for something like this to come together. It takes people who are willing to volunteer to help run, score, scribe, cook and manage the entire event. It also takes generous company sponsors like Brison, Cermark, Desert Aircraft, DesertWare, Du-Bro, Futaba, Great Planes, JR, Midwest, Ohio R/C and Tru-Turn, who supplied more than $2,000 worth of equipment for a raffle. Without their help, there would be no Nationals. Many of the contestants would have loved to be the new national champion, me included, but I must say that the most rewarding part of the contest was meeting all the people I had been emailing back and forth for months. To me, meeting new people and making more friends is more important than winning. Just think, if the only people who showed up were the people who expected to win, the contest would be pretty small, wouldn't it? A competition is about people, memories and fun; the plaques are merely the reminders.

MODEL AIRPLANE NEWS HOW TO

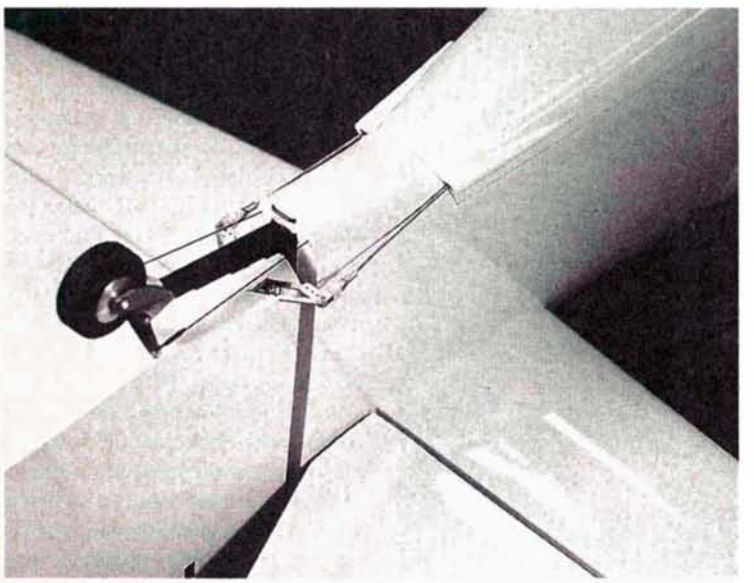
WHEN YOU LOOK at the tail section of this aircraft, it is not obvious that it houses the radio system. Actually, the battery, receiver, two rudder servos, two elevator servos and their pushrods are all tucked away under the tail fin. I've always had a keen interest in radio installations. In this one, there are no servos, no pushrods, no elevator horns and no screw heads sticking out of the aircraft, and everything is hidden under a hatch that has no visible fasteners.



Conceal tail-control systems

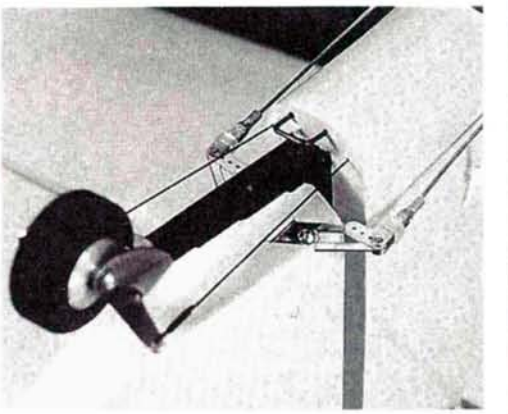
by FAYE STILLEY

Easy access for giant-scale models

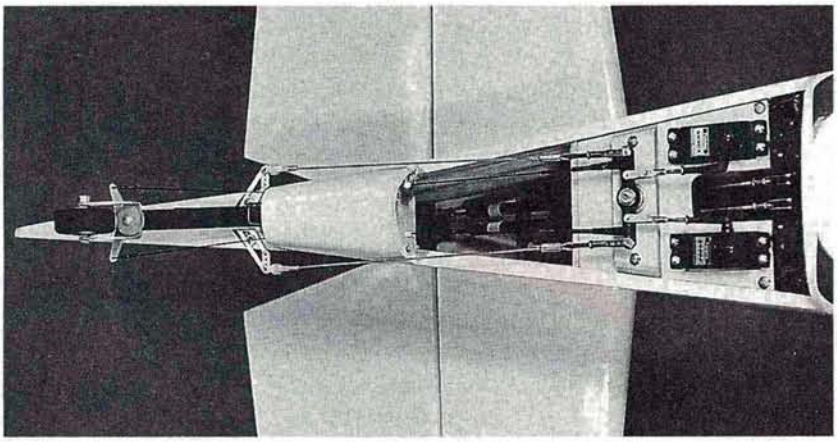


1 A close look at the underside still doesn't give much of a clue as to what is inside. What is obvious is that the tailwheel is mounted on a leaf-spring device and has steering cables that are separate from those of the rudder. The rudder cables exit through small streamlined cowls that appear to be part of the fuselage.

2 Those small cowls over the rudder cables are really on the hatch. With the hatch removed, the almost invisible "hatch latch" is exposed. The small, black piece of steel wire bent into a square U below the tailwheel bracket locks the hatch into place when it is pushed up against the fuselage. This photo shows the closed/locked position. When the wire is pushed in, its ends penetrate the aft end of the hatch cover and lock it securely. The forward end of the hatch cover has two small dowels that hold it in place.

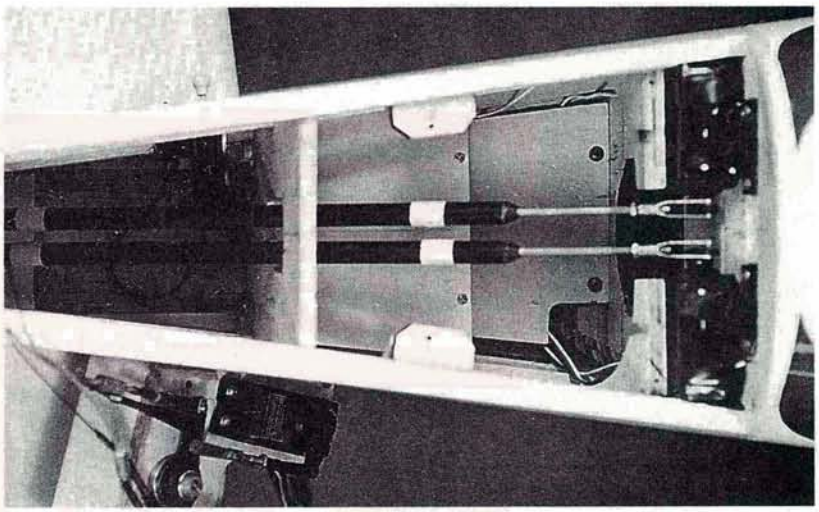


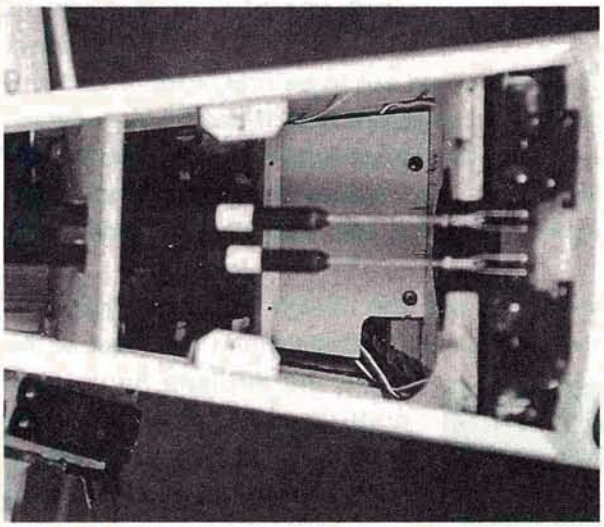
PHOTOS BY FAYE STILLEY



3 With the hatch removed, the entire pull/pull setup for the rudder and the tailwheel is visible. To get maximum throw, the cables are connected to the outermost holes in the tiller arm. Ground handling would be dicey if the tailwheel swung that far from side to side, so the steering ratio was reduced by connecting the tailwheel cables farther inboard on the tiller and adding long steering arms to the tailwheel yoke. The cables travel in plastic tubing that guides them through the aft end of the fuselage. Two rudder servos are used to drive that big rudder. They are hooked up in a push/pull arrangement and driven off a Y connector.

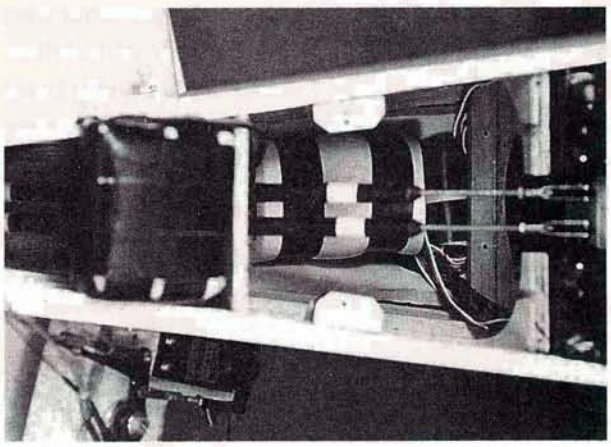
4 Without disconnecting any of the pull/pull cable, the rudder/tailwheel assembly is removed in its entirety, exposing the elevator servos and pushrods. The elevators have torque rods with the horns pointing down into the fuselage. The pushrods are made of arrow shafts. The servos are mounted vertically and face each other so the pushrods travel in a straight line back to the elevator horns. To make the pushrods exactly the same length and eliminate any differential in their throw, one servo has a reverser installed. The servos are connected with a Y-harness; this eliminates the need to slave one servo/channel to another and allows the transmitter trim to affect both servos. The battery and receiver compartments can be seen below the pushrods.





5 The battery-compartment cover has been removed to expose the battery. It is just forward of the former and looks black because it is wrapped in foam and tape. The switch harness is mounted just aft of the former. It is accessible from the exterior of the fuse, just under the stab's leading edge.

6 The battery compartment is built onto the receiver compartment cover. Here, both the battery- and receiver-compartment covers have been removed to expose the receiver, which is wrapped in foam and rests on a foam pad. The small object wrapped in foam that's just forward of the receiver is the servo reverser. The servo extensions for the ailerons, throttle and smoke are routed through the fuse on the port side, and the antenna is routed on the starboard side.



This small cat really purrs

the CHEETAH

by RANDY RANDOLPH

ACCORDING TO Jane's "Pocket Book of Light Aircraft," the original Cerva CE.43 Cheetah had its first flight in 1971. Produced in France as a four-place airplane with a cruising speed of 192mph when powered by a 250hp Lycoming 10-540-C4B5 engine, it had a wingspan of 10 meters, an overall length of 8.4 meters and a sea-level rate of climb of 1,080 feet per minute with a service ceiling of 17,400 feet and a maximum range of 1,800 miles. These are all good numbers, but what it really has is a very nice arrangement of wing, tail and fuselage to make a good flying, R/C model airplane!

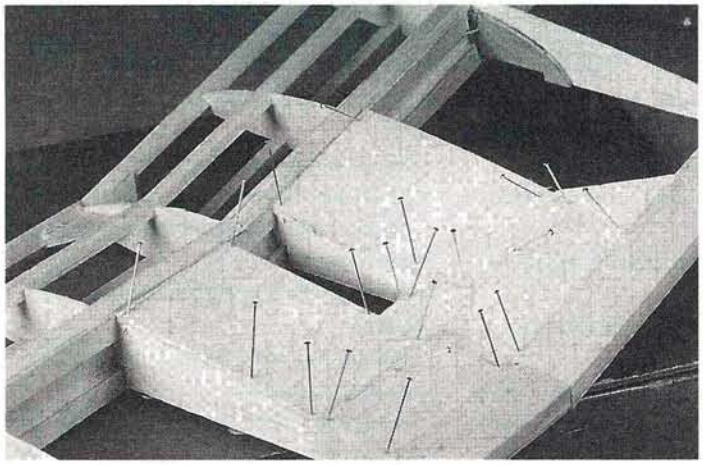
For some time, I have wanted to put one of my O.S. .15s to work, and the Cheetah looked like just the airplane for it. In fact, it has turned out to be one of the best flying airplanes my 20-year-old .15 engine ever snuggled into! It has all the characteristics of a trainer, yet is frisky enough to provide a lot of quality sport flying on a nice, low-fuel budget. With a low wing loading, it moves along rather quickly with modest power and slips through the wind very nicely; it is definitely not a calm-weather friend.

A number of liberties have been taken with the design that would probably cause a true scale believer to shiver, but all of the outlines and the flavor of the full-scale airplane have been pretty much retained. This airplane will not disappoint you; it is fairly easy to build and looks good in the air and on the ground. To build one, why not start with the wings?

PHOTOS BY RANDY RANDOLPH & DEBRA SHARP

WINGS

The first step is to make a template of the rib section and cut 22 ribs from fairly firm sheet balsa. You can saw them out all at once from a stack of blanks or cut them out one at a time by drawing around the template and making a "printed sheet." Select four ribs and trim 1/16 inch from the top and bottom of each, then trim 1/16 inch from each side of the main spar notches. These are the center-section ribs, and the enlarged spar notches are to make way for the 1/16-inch ply dihedral braces. Cut four gear-mount braces from 1/16-inch ply and glue them into place on four ribs— two left and two right. Cut the 1x1/8-inch notch in each of these ribs to match the ply braces.



Since the four center ribs are trimmed to receive the center sheeting, it is laid between the spars. One of the 1/16-inch ply landing-gear mount braces is shown at the upper right.

Cut out the main spar webs and the TE sheet from 1/16-inch balsa. The dihedral braces are from 1/16-inch ply. As a general rule, I like to strip my spar stock from sheet stock because it gives better control of the finished product, but excellent spar stock is available from most hobby shops. The tips are cut from fairly soft 1/8-inch sheet.

Cover the plans with wax paper and pin the main spar and bottom TE sheet into place over the plan. Build each wing half by gluing the two ribs that carry the landing-gear mount, and the mount, in place on the spar and TE sheet with a spar web between them. Then add webs and ribs to the second center-section rib, and add the rest of the ribs out to the tip. The center rib will be added after the wing halves have been joined to create the servo well. When all the ribs and webs are in the proper places, add the top main spar, the front top spar, the LE and 1/8-inch square TE. Taper the 1/8-inch-square TE strip to blend into the rib section. The other wing half is built in the same way. While the glue is curing, cut out the four 1/16-inch ply dihedral braces.

When the glue has set, separate the wing halves, prop the tip of each panel up 3 inches, and sand the dihedral bevel into the center spars and the LE and TE. Pin one panel flat on the bench, and raise the tip of the other 6 inches; then join the halves at the center with the dihedral braces. Clothes pins are excellent clamps for applying gluing pressure to the ply-to-spar joints.

Cut the two center ribs apart at the main spar notch, and fit the two aft pieces between the spar and the TE as shown on the plan. Form the servo well by adding a piece of scrap, 1/8-inch sheet between these two as shown. The two LE rib pieces are joined and glued between the main spar and the LE at the center. The bottom LE spar should be installed at this time. Add the top TE and the top and bottom center-section sheet, leaving the servo well open at the top. Glue the wingtips at the center line between the LE and TE of the outboard ribs. Use pieces of spar stock between the spars and the tips and soft scrap balsa at the TE. Sand the completed wing.

Bend the aileron horns and epoxy the brass tube to the wing TE as shown on the plans. Be careful not to allow any glue to seep into the tube/wire bearing. Cut the ailerons from 1/4x1-inch aileron

SPECIFICATIONS

Name: Cheetah

Type: sport

Wingspan: 53 in.

Length: 33.5 in.

Weight: 40 oz.

Wing area: 450 sq. in.

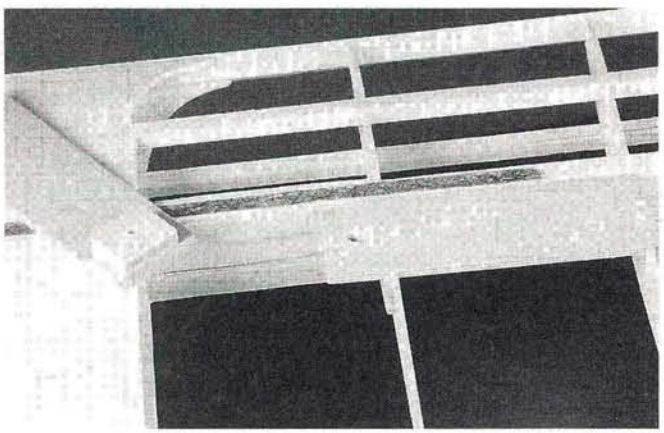
Airfoil: flat-bottom

Radio req'd: 4 (aileron, rudder, elevator and throttle)

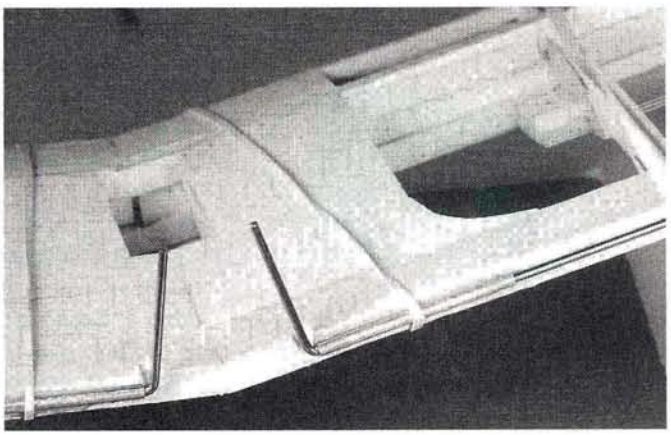
Engine req'd: .10 to .25 2-stroke

Engine used: O.S. .15

Comments: the Cheetah (FSP03981), designed by Randy Randolph, is a great flying, good looking, low-wing sport monoplane with plenty of performance for a .15-size airplane. Its all-wood construction using balsa and ply makes this a traditional building project with minimal skill required. The wing is constant chord and the horizontal stab is built up.



The landing-gear mounts are cemented to the braced ribs as well as to the main spar; 1/4-inch plywood pads are added to the 1/8-inch ply mounts and drilled to receive the gear torque anchor.

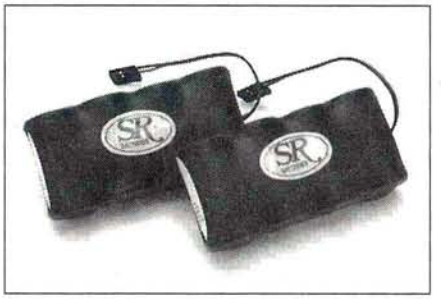


Rubber bands work great to hold the aileron torque rods in place while their brass bearings are epoxied to the wing. Notice notches sanded into the trailing edge to allow full movement of the aileron horns.

SR Giant Scale!

If you're into Giant Scale aircraft, we've just introduced some new battery packs specifically for you!

Our new ***1600 Series*** pack replaces our 1500 Series pack that so many of you have chosen as the standard for Giant Scale aircraft. In addition, we've also updated our 1800 Series pack replacing it with our new ***2000 Series*** pack.



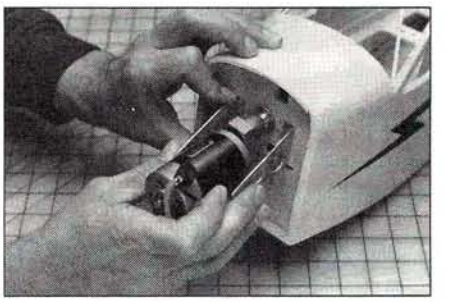
The exciting thing about these two packs is that they will give you much more flying time than a 1200mah pack yet they are no larger or heavier! *Both* the ***1600 Series*** and ***2000 Series*** packs weigh 7.4^{oz} and in a flat pack measures only 3.5" x 1.7" x .9" .

If what you really want is a 1200mah pack, no problem! We're also introducing our new ***1200 Series*** pack that only weighs 5.4^{oz} and in a flat pack measures only 3.5" x 1.4" x .9"! As you can see, it's much smaller and lighter yet it still gives you all the power you'll need for large aircraft with lots of servos.

In addition to our new packs, we've also added ***Volume R-7*** to the ***R/C Techniques*** library. Volume R-7 will tell you everything you ever wanted to know about the wiring of large scale aircraft. If you're not familiar with *R/C Techniques*, it's a bi-monthly publication we publish covering all phases of our R/C Hobby. We maintain a complete library of back issues so that you can catch up on anything you've missed. Here are the specific questions answered in *Volume R-7*:

- Why would you need a higher capacity battery pack?
- Why wouldn't you need a higher capacity battery pack?
- What size range is generally the best to use?
- Other than capacity, why else wouldn't you want to use a standard size battery pack on a Giant Scale aircraft?
- What does the internal impedance of the pack have to do with your pack choice?
- How low a voltage is too low?
- What charge rate should you use?
- Can you extend the charge time to make up for a charger that doesn't charge at a high enough rate?
- Why shouldn't you use a "peak detection" charger?
- Should you use a 4 or 5 cell pack?
- Why would you want to use a 5 cell pack?
- Why wouldn't you want to use a 5 cell pack?
- Why don't 5 cell packs give you more flying time?
- What wire size should you use?
- How should you extend the leads on a battery pack?
- What size wire should be used for servos?
- Which is more important, the battery pack lead or the servo leads? Why?
- Should you ever use an aileron extension to extend a battery pack lead?
- Is there a better type of system switch?
- Why should you only use "slide" switches?
- How can you use double switches?
- What cycler and ESV loads should be used on larger packs?
- Which battery backup systems are best?
- Do you really need one?
- How can I power the receiver from one pack and the servos from a second battery pack?
- What receiver modifications are necessary?
- What size pack should be used to power the receiver?
- What size pack should be used to power the servos?
- How shouldn't you power accessory items such as smoke pumps and ignition systems?

The best part is that ***Volume R-7*** of *R/C Techniques* is only $3 including postage! We'll even include a complete index to both the *R/C Techniques* library and the *Electric Flight Techniques* library at no extra cost!



By the way, ***Volume E-14*** of *Electric Flight Techniques* gives you complete instructions and plans for converting the Hangar 9 Giant Scale Cub from gas to electric power!

Call us if you have any questions or to place an order. You can reach us at SR Batteries, Inc., Box 287, Bellport, New York 11713. Our phone is 516-286-0079 and our fax is 516-286-0901. Our Email address is 74167.751@compuserve.com .

-ADVERTISEMENT-

FLIGHT PERFORMANCE

• Low-speed performance

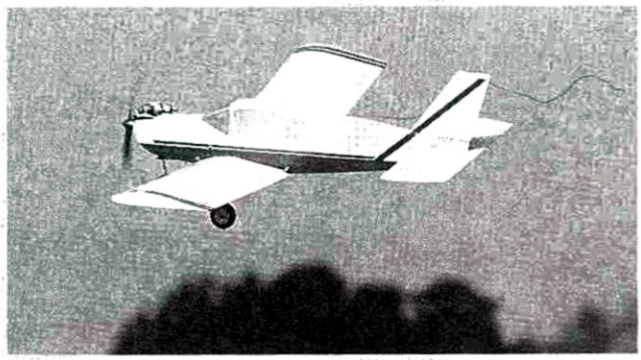
Since wing loading is light and the stall is gentle, this airplane can cruise comfortably at less than ½ throttle with solid control of both elevator and ailerons. In winds of 10 to 15 knots it can almost be made to fly backwards with full control. Just before the stall, there is a decided "nibble" to warn you so you won't be surprised!

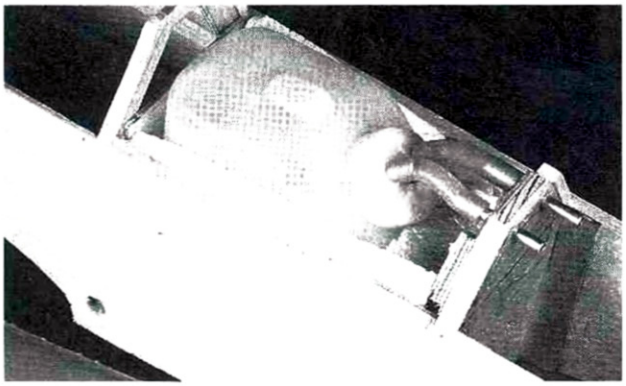
• High-speed performance

This is a clean airplane and will step out very nicely under full power. There is only a slight trim change that takes place from low to high speed, but it is no more than it should be, since power controls altitude and elevator controls speed. Control response remains very close to the same with power changes, and no directional correction is needed with changes in power settings.

• Aerobatics

It might be necessary to increase the aileron control throw and add a touch of rudder to perform really axial rolls. This isn't a pattern airplane, but it will go where the nose is pointed. The trick is to point the nose where you want the airplane to go! Inverted flight will require some forward stick to keep the nose up, but not as much as you might expect, and outside loops are not a lot bigger than inside. You must slow it down for snap maneuvers and spins, which are usually initiated with a power burst to kick the tail around. All in all, this Cheetah won't bite; it's just a pet that makes you feel good!





After the fuselage sides have been joined and before the turtle-deck sheeting has been added, the fuel tank, fuel lines and throttle lines should be installed while they are still accessible.

stock, trim the outboard tips to blend into the wingtips, and groove and drill the LEs to receive the aileron torque rods. The ailerons will be added to the wing when it is covered.

TAIL SURFACES

Build the stab over the plan. Though not absolutely necessary, the 1/16-inch ply spar doubler goes a long way toward reducing "hanger rash" when loading and unloading the airplane. The 3/16x1/8-inch diagonal braces just about eliminate the chance of warping and add little to the weight. When the stab is complete, use masking tape to attach the elevator to it, then sand both to final shape. The fin and rudder are cut from 3/16-inch sheet. The fin LE is hard, 3/16-inch sheet to provide a good anchor into the fuselage top sheeting.

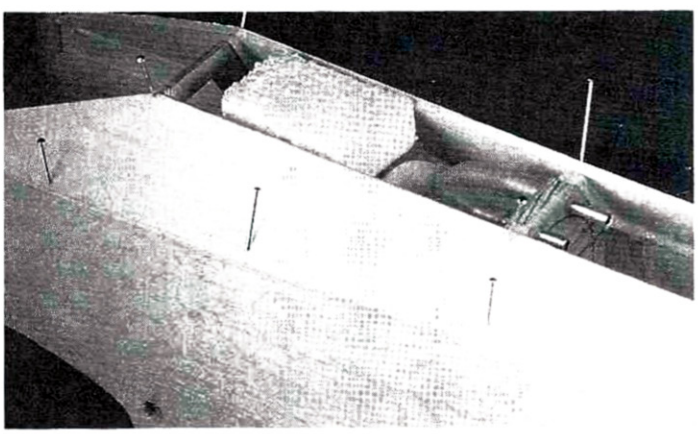
FUSELAGE

The fuselage is a simple slab-sided box. First cut out the two sides from 3/32-inch medium sheet balsa. The bottom half of each side should be cut first from 3-inch wide sheet, then the top half, from the cabin aft, cut to shape and edge glued to the bottom half to form the sides. This will eliminate the necessity of buying 6-inch-wide stock. When the sheet sides are complete, add the 3/32-inch doublers and the 1/16-ply triplers (in the firewall area) to both sides. Don't forget that there is a right and left side!

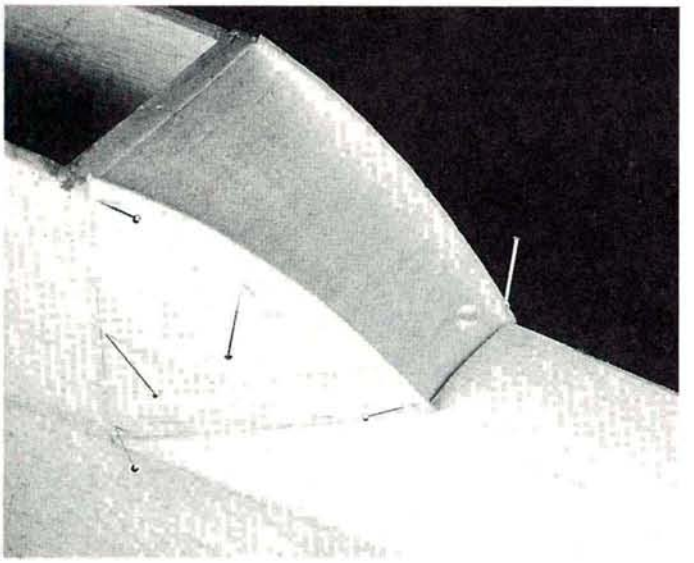
Add the 3/32-inch-square uprights and longerons aft of the cabin and wing as well as the servo-mounting rails in the cabin area. If you intend to use a 2-ounce tank as shown on the plans (4-ounce for .20 to .25 engines), add the tank-mount rails at this time. I usually use an aliphatic-resin glue for all of this work; however, epoxy works fine for the doublers and the ply tripler.

Place the two fuse sides together and sand them until they match. This is a good time to drill the holes for the 1/4-inch dowels that will hold the wing, and the exit hole for the Nyrod to the elevator. While the sides are still joined, mark the location of the firewall and formers on the inside of both.

Make the firewall, F2, from 1/4-inch ply, and drill it for the engine mount, fuel lines, throttle line and nose-wheel mount. F3 is cut from 1/8-inch ply; F4 and F5 are built up from hard, 1/8-inch balsa, and F1 is from 1/8-inch sheet balsa. Drill F3 for the throttle line. Glue F3 and F5 to one of the fuselage sides. Use a right triangle to be sure they are square, and when the glue has set, glue the second side to the formers directly over the first. Again, use right triangles to align the sides, nose and tail of both fuselage sides to be sure that they are in perfect alignment. When the glue has set, add F4 and the cross-brace at the top of the cabin.



A foam block above the tank secures it in place as the top turtle sheet is added. The angled sheet should extend a little above the formers so it can be sanded flush with the top of the formers.



The windshield is slightly curved when it is glued between formers F3 and F4. Then the two side pieces are trimmed to approximate shape, glued into place and sanded.

Check that the fuselage is square and at right angles to both formers. Then bevel the sides at the tail and glue them together. Check that everything is in line while the glue sets. Epoxy the firewall to the ply triplers. Again check for perfect alignment, and clamp the firewall in place while the glue cures.

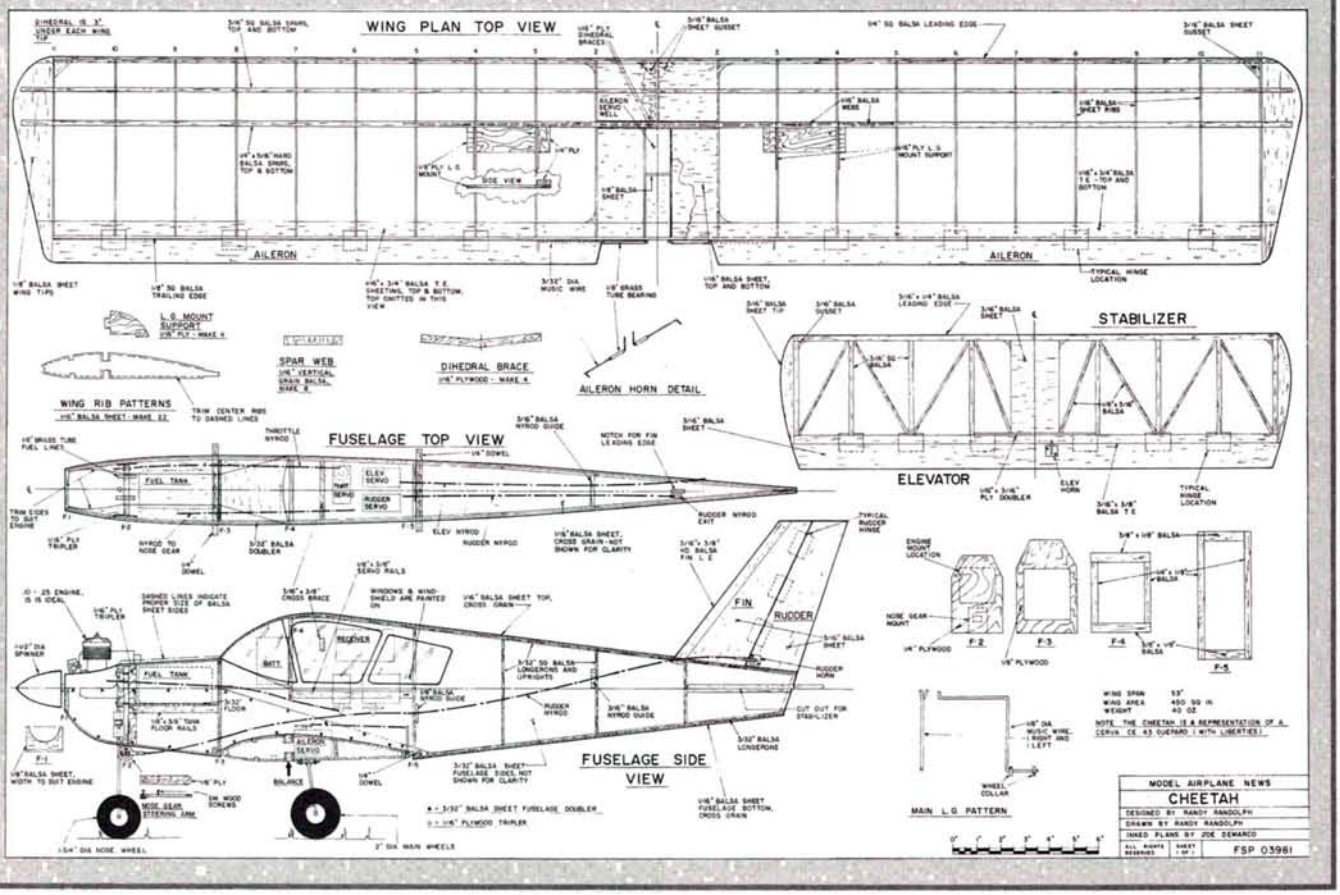
Now is the time to mount the tank, fuel lines and throttle lines. Glue in the 3/32-inch tank floor, and run the Nyrod throttle line through the firewall and F2 into the cabin area. Wedge the tank in place with blocks of foam. The fuel lines are 1/8-inch copper tube epoxied through the firewall and connected to the tank with fuel line. Give the firewall a coat of paint (or epoxy glue thinned with acetone), and when dry, install the nose-gear mount. Bring the two sides together at the nose and epoxy F1 into place.

Use the dotted lines on the plan as a template, and cut the two 3/32-inch balsa top turtle deck sides and glue them to the fuselage sides, the firewall and F3. They should stick up above the firewall and F3 a little so they can be sanded flat with the top of these formers. When the glue has set, sand the sides flush with the tops of the formers. Add a small block of foam above the tank and glue the top turtle-deck sheeting from the firewall to F3. When the glue has set, sand the top flush with the sides.

Measure the width of the top of the cabin and the width of the top turtle-deck sheeting, and cut a piece of cross-grain 3/32-inch sheet that is slightly longer than the distance between the two. This piece will be roughly 1 1/4 inches wide at the turtle deck, 2 1/2 inches at the cabin top and 3 3/8 inches long. Actually, it should be cut so that it is 1/16 inch smaller on each side than the cabin top and the top turtle deck to allow for the 1/16-inch sheet that will be added to both sides. Glue it into place between the cabin top and the turtle deck. It should bow upward about 1/8 inch in the middle. This piece forms the center of the windshield.

Make a cardboard template and fit it to the cabin side, the windshield and the side turtle-deck sheet. It will be a triangle with

To order the full-size plans (FSP03981), see page 111.



one side curved to fit the windshield. When the template fits, cut two side windshields out of 1/16-inch sheet and glue them into place; they should protrude slightly above the center windshield so they can be sanded flush after the glue has set. Finish the cross-grain sheeting from the cabin aft and on the bottom from the wing mount aft. Install the Nyrod guide for the elevator from the cabin area to the fuselage side and for the rudder through the top aft sheeting.

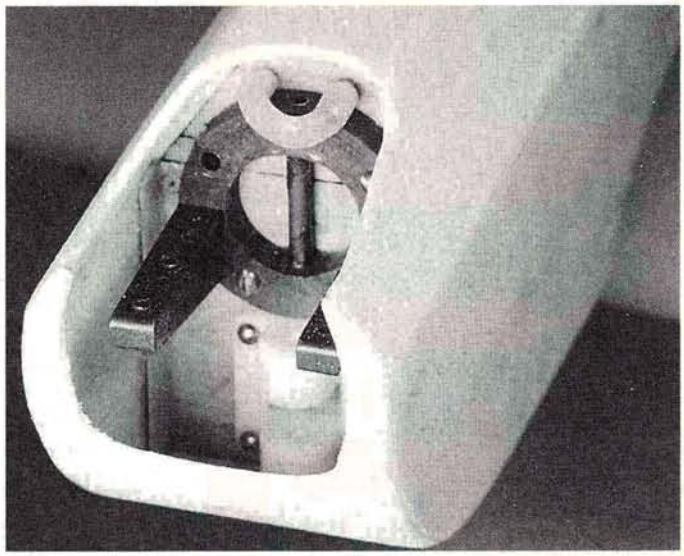
Make the nose gear steering arm from 1/8-inch ply. Slip the arm through the spring of the nose gear and anchor it securely with two wood screws—one on either side of the spring. Sheet the cowl bottom with 1/16-inch balsa to about halfway back to the wing mount. Cut a hole for the nose gear and temporarily mount it on the firewall. Install the Nyrod guide from the rudder servo so it matches the steering arm. Then complete the bottom sheeting.

Temporarily install the engine mount and engine, trimming the cowl for an easy fit around the engine. Remove the engine mount and give the whole engine compartment a good coat of thinned epoxy glue or paint. When dry, sand the completed fuselage.

It's a good idea to bend and fit the main landing gear so the holes for the gear clips can be located and drilled before the airplane is covered. Also, you may need to drill a small hole in the front of the bottom cowl to allow the nose gear to be secured in its mount.

COVERING AND FINAL ASSEMBLY

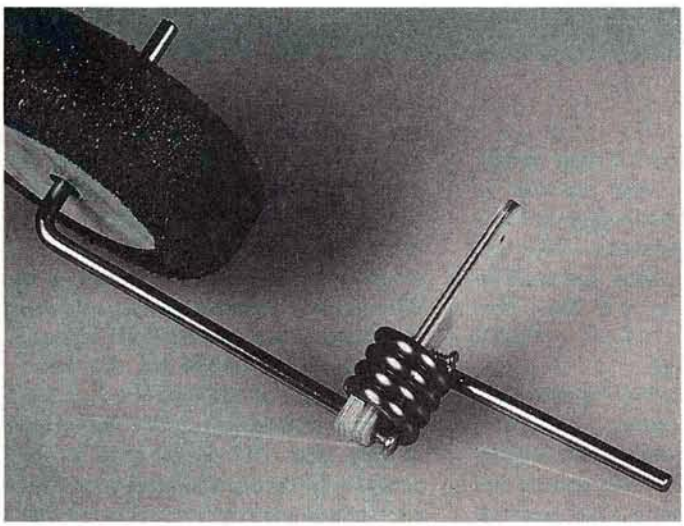
The original was covered with Oracover* and MonoKote*. Both work just fine, so take your pick. Cover the fuselage, then strip and trim the covering where the fin and rudder and stab will be mounted. Cover and hinge the tail surfaces; then, where they touch the fuselage, strip the covering away to provide a wood-to-wood joint so the glue will form a firm bond. Glue the 1/4-inch wing hold-down dowels through the fuselage, and paint them to match the covering. After the wing and ailerons have been covered, glue the 3/32-inch aileron torque rods into the slot in each aileron while they are being hinged to the wing. Again, use care to keep glue out of the bearing. The aileron horns should be vertical when the ailerons are neutral.



The opening in the cowl must be trimmed to fit the engine. Fuel tubing seals off the fuel and overflow lines while work on the fuselage is completed.

Install the wheels with wheel collars or solder and washers. Slip the nose gear into its mount, and connect the steering arm. Attach the main landing-gear legs to the gear mount with plastic clips, and install the engine mount. Once the engine has been mounted, it is time to install the radio.

The easiest way to install the three servos in the fuselage is to make an 1/8-inch ply tray that fits between the servo rails, and mount the servos on this tray with small wood screws. Before gluing the tray to the rails, install the aileron servo in the wing and the receiver and battery pack in the fuselage. Balance the airplane at the main wing spar by moving the servo tray back and forth. When the balance is correct, glue the tray in place. If a lighter engine is used, the battery pack can be placed in the area under the fuel tank to achieve the proper balance. The receiver antenna can be brought out through the top of the cabin and attached to the top of the fin. Remove any warps that might have crept in during assembly and covering. The control throws should be set as follows: 1/2 inch left and right for the rudder, 3/8 inch up and down for the elevator and 1/4 inch up and down for the ailerons (all measurements made at the TE of each surface). After a range check, the airplane should be ready to fly.



The nose-gear tiller is made of 1/8-inch plywood and held in the center of the gear spring with small wood screws on both sides of the spring—light and effective.

AT THE FIELD

On the first flight, taxi around a bit to get used to the ground handling, line up on the runway, and go to full power. Since the main gear is well aft of the balance point, some up-elevator must be given before the airplane will rotate. This setup makes for smooth landings and just a little extra effort on takeoff, but by the second takeoff, you won't even notice!

Once in the air, trim for level flight at full throttle, which should be well within range of the transmitter trim controls, and make a few circuits to become familiar with the airplane. You will find that it is easy to make smooth turns and that it will maintain flight with just a couple of clicks of throttle. To get the feel of things, try some power-on and power-off stalls, which will be gentle and smooth, then set up for a landing. Cut the power and set up a fairly shallow glide. When near touchdown, keep adding back stick until the main gear makes contact, and you will have made a perfect landing!

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

MODEL AIRPLANE NEWS
HOW TO

Speed, Props and Power

by GREG HAHN

A good look at a well-planned, power-on approach to land. Being properly powered will allow you to shoot this type of final approach: nose down, full flap, correct speed, with power on all the way to flare!

PHOTOS BY GERRY YARRISH & GREG HAHN

WHILE ON A MUCH-NEEDED break from the building shop, I happened to be sifting through a past issue of *Model Aviation* and came across the rules meeting report and a list of proposed changes for '97. Of course, I skipped right to the scale section and noticed a couple of proposals from Ken Walters pertaining to his favorite topic, "scale-like speed." Ken has been hashing and rehashing scale speed and scale realism for years, mostly focusing on ways to mathematically quantify speed and therefore give it a place of its own on the score sheet. Ken has a very good point, and I agree 100 percent with his ideas but have found that his articles are, at best, technically difficult to understand. The point gets lost and, unfortunately, so does most of the interest, although I do agree that there needs to be more emphasis placed on the issue of speed.

"Scale-like speed" is thrown into that catch-all category called "scale realism," which is the 10th maneuver in the AMA rule book and at Top Gun is figured into each maneuver at the end. Either way, speed is low priority on the score sheet and also to most of the judges. I have to admit, though, when the speed is right, everyone notices—especially the judges. In the effort to keep scoring as simple as possible, we'll probably never see speed in a category of its own. Even so, most judges seem to put quite a bit of emphasis on it; this means you should, too. If you give judges what they want (a good, smooth presentation at the right speed), then they'll give you what you want (a high flight score). If you happen to question a judge and he says that you're flying too fast and you realize you can't do anything about it, you're hurtin'! This brings me to the main topic of how I achieve scale-like speed.

Scale speed and flight presentation are issues that I like to address in the planning stages of any competition project. Along with 3-views, color photos and chips, etc., you should also research flight characteristics so your model can be powered and configured to fly accurately. Of course, the easiest and safest way to go on power is to stick with the plan or kit manufacturer's or designer's recommendations, which are usually more than adequate for the size and weight of the model. I like to look at the full-scale performance figures, particularly the horsepower-to-gross-weight ratio (not overload), to decide on the power requirements of my models. I've used this ratio to configure power for several models, and I've found it to be very accurate in providing the proper flight attitude and speed to achieve good flight scores.

To use this system correctly, you must

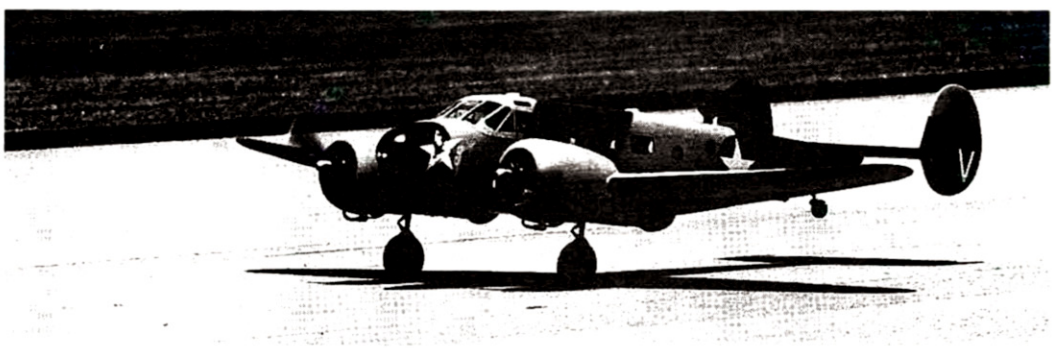
first estimate the finished weight of your model. Generally, you'll want to take the expected weight from the plan or kit manufacturer and then figure in your normal building style: light or heavy. You don't have to get it down to the ounce, but try to get it within a couple of pounds. You must also know how much horsepower your prospective engine puts out at cruise rpm, or ¾ power. To keep this simple, a good rule of thumb for any normally aspirated, gas or methanol 2-stroke is 1hp per cubic inch. Anyone who tells you that their 2ci engine puts out 4 or 5hp is dreaming or doesn't understand the math. Normally aspirated (carburetor, non-turbo-charged) 4-stroke engines come in around 0.7hp per cubic inch.

From there we look at the performance figures of the full-scale version. Try to get the specifics as to gross weight and horsepower of the particular model (B, D, J, etc.), as they usually differ. Divide the horsepower by the weight down to where you know how many pounds each horsepower is carrying. During WW II, most fighter aircraft had a power-to-weight ratio of 1:8, or 1hp to every 8 pounds; bombers were usually around 1:10. If you look at different types of aircraft, you'll find that these numbers are pretty much universal to most piston-engine, propeller-driven aircraft, with the exception of aerobatic types and a few other special-use planes. Now take these numbers and apply them directly to the model you want to build. This will give you the engine size required to fly that model with as close to scale speed and performance as possible. To clarify things, here are a few examples.

Willis Lewis's Ziroli F4-U is sittin' pretty. This plane is flying; it's not being dragged through the air by too much engine (30 pounds; Zenoah G-62; Zinger 24x10 prop).

Say you want to do a big P-47D model with a 92-inch wingspan. The plans call for a finished weight of about 30 pounds and for minimum power of 5ci or higher. You've read a review of the plans in your favorite magazine, and the builder said that the finished model came out right on at 30 pounds and, with a 5.8ci engine, would go straight up out of sight and knife-edge well. (Oh boy, that's just what I want to see: a Jug that can fly like an Extra!) You're an average builder, but you're going to detail this model for competition so want to add 5 pounds to make up for the details. This will bring the finished weight to 35 pounds. While scouring your documentation sources, you notice that the P-47D was powered by a Pratt & Whitney twin-row radial rated at 2,300hp and had a loaded gross weight of 18,000 pounds. Dividing down the full-scale numbers gives us a power-to-weight ratio of 1:7.8, or 7.8 pounds per 1hp. With this information, take the full-scale ratio and apply it directly to your proposed model weight (35 pounds). You'll come up with a required horsepower of around 4.4. This translates into a 4.2 to 4.5ci engine or, for those of you who like to think in metric, 65 to 70cc. I understand that the 4.2ci engine, which the numbers recommend for this size and weight model, is a long way from a 5.8ci, but we're talking "scale" here. It's very difficult—if not impossible—to create the "illusion" with an over-powered model. The key: if your model is powered right, you won't have to create the illusion, it will do it for you by flying correctly!

Here's an example that might scare you, but trust me. At 101 inches, the Ziroli AT-6 should come out somewhere around 25 pounds. We all know that the standard power for this model is a G-62, which is a 3.7ci engine. The kicker is that the T-6 was a trainer during WW II and had a full-scale power-to-weight ratio of a little more than 1:10 (bomber standards), which means that at 25 pounds, this model should be powered by a 2.4ci (G-38) engine. Contrary to popular belief, a G-38 does fly this model very well; in fact, for scale, I have to say, it's almost perfect. The model will use up quite a chunk of runway to get airborne, carry just the right speed at about ¾ throttle and go from horizon to horizon in a roll. It even lands well because you can



Above: using a power-on approach gives you full control of the aircraft at flare. Using the correct landing attitude usually eliminates gear abuse and looks great.
Right: having the right power and prop combination is the only way to achieve consistent ground-handling performance from this otherwise difficult twin tail-dragger. Too much power here would make almost any type of a smooth takeoff impossible.

carry 35 percent power with full flap over the fence instead of having to go to idle on the downwind leg and never really getting the approach speed under control (as is usually the case with a G-62 up front). The aircraft is actually flying on the wing and not being dragged through the air by the engine. The only real trade-off is control-surface authority. Until you get used to it, a correctly powered model will have a mushy feel and will seem slow to command response. Sounds like flying full scale! Isn't that what we want?

PROPELLERS FOR SCALE

I catch a lot of guff over my prop selection. As I said before, creating the illusion can be a lot of work, so I want the plane to do as much of it as possible. As in other forms of R/C competition, such as aerobatics or pylon racing, prop selection is important if you want your beauty to look and act right. The list of recommended props from the engine manufacturer will provide good performance under most conditions, but I've usually found them to be a tad small for scale performance. I try something new from time to time, but I always end up using a prop that's one or two steps larger (in pitch, diameter or both) than what was recommended. I normally "over prop" so I can get the airplane to react in ways that can't be easily controlled with the sticks. I guess what I'm trying to say is that the bigger props tend to mellow the reaction time of the throttle and the control-surface sensitivity. The big props also hold rpm down around 5,300 to 6,000, which is plenty for providing the needed performance and does a good job of controlling sound. Nothing sounds worse than a propeller that should be turning only 3,000rpm turning 9,000rpm, and that's at 100 percent power. If you've watched full-scale aircraft fly, you probably noticed that nothing happens very quickly. Whether they're in the air or on the ground, airplanes never make sharp or jerky movements, and there's always a certain delay time. By using a prop that's too big, the model seems to acquire this delay time. I've never had a problem with the actual transition of throttle, but it slows down the transition time. This is very handy at takeoff, causing the plane to require less rudder to compensate for "P" factor and providing longer, slower takeoff runs that look more "scale." The same holds true at approach and landing, where the big prop creates more drag at lower power settings to make speed control easier where it's most important. Don't be afraid of lost performance with a big prop; of course, there will be a decrease in rpm, but the larger prop creates more thrust. It just takes longer for the plane to get up on step. Instead of rocketing off the runway in 10 feet, it will take a full lap to reach cruising speed.

See the chart for a list of displacements and recommended prop sizes. It may be a little mind-blowing, but at least give it a thought. Keep in mind that at first your plane will probably feel sluggish, but I think you'll like the difference when you get used to flying without the sharp edges. Your scores will show the positive effects, too!

Engine Displacement	Recommended Prop Size
1.5ci (G-23)	15x10, 16x8, 16x10, 17x10
2.4ci (G-38)	18x6-10, 18x10, 20x6-10, 20x10, 18x10 (3-blade)
2.8ci (G-45)	18x10, 20x10, 22x6-10, 22x10, 20x8-14 (3-blade)
3.7ci (G-62)	22x6-10, 22x8-14, 24x10, 22x6-10 (3-blade)
4.2ci	22x10, 24x6-10, 24x8-14, 24x14

PRACTICE (FOR REAL)!

For many years prior to jumping into the chasm of scale competition, I watched, listened and tried to pick up as much information as I could. I probably own every scale contest video that has been produced in the last 10 years or so. One thing that stood out each year was how often many of the top-echelon competitors struggled with the flying portion of the score card. Of course, just seeing a few short clips of each plane in flight doesn't give any real indication of what the problems are. In other words, on video, they all look pretty darn good—so why all the low flight scores? I often thought that it had to do with tough judging or adverse wind conditions, but after being in competition for a couple of years, I realize that most low scores can be attributed to a lack of practice or, specifically, practice with the competition plane and poor flight planning (presentation).

Some maneuvers just don't look scale.

We all know what practice is, and all of us can use more of it, but the flight plans always get lost in the rush. I don't know how many times I've heard up and down the pit line: "Should I do that loop today, or should I put in a roll instead?" A half hour before showtime in the pits is not the time or the place to decide on your maneuvers. Impromptu won't get you any extra credit! Dave Platt summed up the general scale-flying attitude a few years ago: "You need to get all the points you can in the building shop because flying points are hard to get." Most scale competitors look at the flight portion as something they "have" to do, not something they "like" to do. They forget that to be truly competitive, one must be "balanced." I guess the answer to "How do you get good flight scores?" is the same as how you get to Carnegie Hall: practice, practice, practice! See you at briefing!

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Fiberglass flying boat

HOBBY LOBBY INTL.

PBY Catalina

by JIM RYAN

HAVING first flown in 1935, the Consolidated PBY Catalina was already obsolescent by the beginning of WW II. In spite of that, it served in every theater and in roles ranging from long-range patrol to air/sea rescue "Dumbo" missions to antisubmarine warfare. Outfitted with ASV radar and painted black for night operations, it terrorized Japanese shipping on wave-skimming "Black Cat" missions. Nearly 4,000 were produced, making it the most-manufactured flying boat in history.

Given its illustrious career and graceful lines, one would expect the Catalina to be a popular scale subject, but with its complex hull shape and twin engines, it's generally considered challenging, but no more. The PBY-6A produced by HVP Modell in the Czech Republic and imported to the U.S. exclusively by Hobby Lobby Intl.* solves both these problems. First, the sleek hull is molded of fiberglass and second, the problems with twin engines are solved by the use of Speed 400 electric motors.

The result is a small scale model with the quality and finish one would normally expect from a much larger kit.

PACKAGING AND PLANS

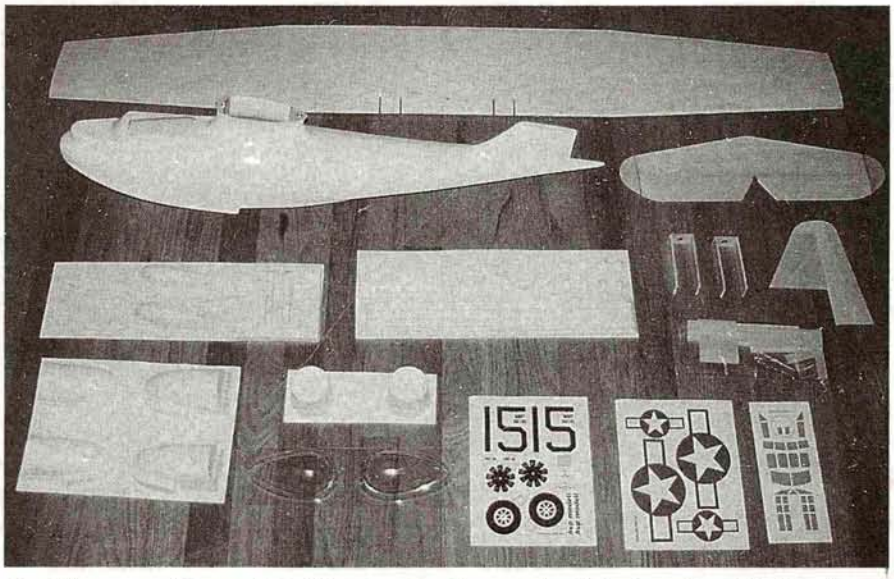
The PBY comes carefully packed in a single large carton. Inside, you'll find a beautifully molded fuselage, a sheeted wing, shaped tail surfaces, vacuum-formed parts and a complete hardware package. The review kit also included the recommended power package consisting of two Graupner 7.2V Speed 400 motors, scale props, prop adapters and a Jeti 30A BEC speed control. All these components are available directly from Hobby Lobby or their distributors.

Because the model is essentially prefabricated, there are no full-size plans, and the instructions, which are written in English, German and Czech, are somewhat rudimentary. The English translation is a bit shaky, and a few steps warrant clarification.

FUSELAGE

The molded glass fuselage is a thing of beauty. Thanks to an unusually thin gelcoat and a very light glass layup, weight is kept to a minimum; the review fuselage weighed a mere 7 ounces out of the box. Before beginning construction, I washed the entire fuselage with cleaning solvent to remove any traces of mold release. Then I lightly wet-sanded the very clean parting seam and filled a few small pinholes with Squadron* white putty. The radio equipment is mounted on a balsa and plywood assembly that goes into the hull astride the step. I assembled the mount with CA, installed the servos and secured the assembly in the hull with Pacer* Zap-A-Dap-A-Goo. The battery slides in right under this mount.

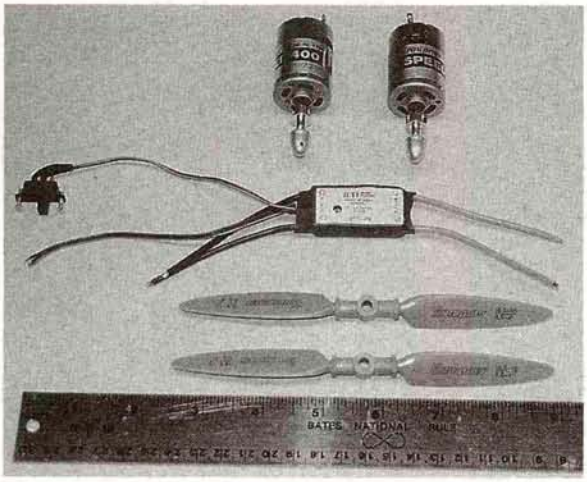
The first inconsistency I found in the instructions was when I read that Figure 3 showed the positions of the pushrod exits. Figure 3 showed no such thing, but the pushrod exits are molded into the vertical fin, so all that's necessary is to drill out the openings and CA the pushrods into place. As it turns out, much later in the instructions, Figure 22 does show the routing for the elevator pushrod. The supplied pushrods are very light and have low friction. Threaded couplers are crimped onto the ends with a pair of wire cutters—a technique I've used before with good results. Be sure you slip the supplied music-wire inserts into the pushrods before you crimp on the threaded ends.



The kit comes with a molded fiberglass fuselage, a sheeted wing, shaped tail surfaces, vacuum-formed parts, a complete hardware package and decals.

EMPENNAGE

The tail feathers come assembled and already sanded to shape. The instructions assume you'll cover the balsa parts with film, but I decided to glass them instead. I finish-sanded all parts and glassed them with 0.56-ounce glass cloth and HobbyPoxy* Smooth 'N' Easy finishing epoxy thinned 30 percent with denatured alcohol. After sanding the glassed parts, I mounted them on the fuse with epoxy. I made small fillets around the stab intersection with Sig* Epoxolite. Finally, I masked off the rest of the fuse and primed the empennage. Because I planned to paint my Catalina, I used Sig Easy Hinges cut in half instead



Two Graupner 7.2V Speed 400 motors, scale props, prop adapters and a Jeti 30A BEC speed control power the PBY nicely.

PHOTOS BY JIM RYAN

SPECIFICATIONS

Model name: Consolidated PBY-6A Catalina

Type: twin-engine electric flying boat

Manufacturer: HVP Modell; imported by Hobby Lobby Intl.

Wingspan: 54 in.

Wing area: 396 sq. in. (as measured)

Weight: 46 oz.

Length: 34 in.

Wing loading: 16.7 oz./sq. ft.

Recommended power: 2 x 7.2V Speed 400 on 7 cells

No. of channels req'd: 4 (aileron, elevator, rudder and speed control)

Radio used: JR X783 with Hitec HS-80 microservos.

List price: $276

Features: gelcoated molded-glass fuse and vacuum-formed parts; foam wing sheeted with balsa; prefabricated flying surfaces; complete decal sheets.

Comments: the PBY is a beautifully executed small scale model that's almost entirely prefabricated. It can be ready to fly in a few days and looks beautiful in the air.

Hits
- Extensively prefabricated with unusual attention to detail.
- High-quality decal sheets.
- Compact size.
- Beautiful scale looks.
- Excellent quality of construction.

Misses
- Rudimentary instructions.
- Spin characteristics require an experienced pilot.

FLIGHT PERFORMANCE

The instructions did not recommend a CG position or control throws. Because the Catalina is somewhat short-coupled, I placed the CG at 25 percent MAC, which comes out to 2 1/8 inches from the LE. I used my JR X783 radio to set the control throws as follows: elevator, +3/8 in.; aileron, +3/8 in.; rudder, +5/8 in. I then set the dual rates so that I'd be able to reduce these in flight if necessary.

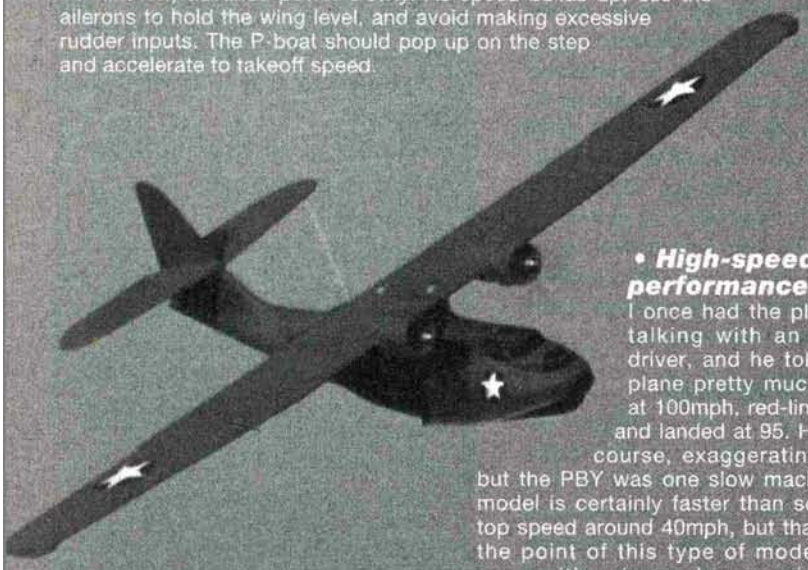
Because of their low current draw, it's common to wire S400 twins in parallel, and the PBY uses this scheme. After talking with Jim Martin at Hobby Lobby, I decided to use eight cells instead of the suggested seven. Experience has shown that this is a better setup for the 7.2V motors, provided the current is kept below 10 amps. Another option is to wire the motors in series and use 16-600AE cells (provided you use a 16-cell controller), and I also tested this setup. Both power schemes worked very well.

• Takeoff and landing

As recommended, the flights were made by hand-launching the Cat and belly landing it in the grass. With its low wing loading, the PBY was easy to hand-launch, and it climbed away with power to spare. I'd recommend getting an assistant to handle the launches until it's trimmed out, but solo launches are not a problem.

Landings are made with a straight-in approach. Keep the speed up during the turn on to final and then cut power, making a slightly steeper approach than normal. Just fly it down and hold it a foot or two off the ground until it settles in. Landings are slow and predictable, and the props and motors are well protected high on the parasol wing.

I haven't yet been able to try the PBY off water. The kit includes clear butyrate plastic that you can use to make a set of side boards for the hull. These are supposed to help keep water spray out of the prop arcs and get the plane up on step more quickly. Jim Martin suggested flying the Cat *without* mounting the tip floats on extended struts. It seems the floats tend to catch on the waves and "water-loop" the plane. The best bet is to carefully balance the wing so that the plane sits level at rest. To take off, advance power slowly. As speed builds up, use the ailerons to hold the wing level, and avoid making excessive rudder inputs. The P-boat should pop up on the step and accelerate to takeoff speed.



• High-speed performance

I once had the pleasure of talking with an old PBY driver, and he told me the plane pretty much cruised at 100mph, red-lined at 105 and landed at 95. He was, of course, exaggerating a little, but the PBY was one slow machine. This model is certainly faster than scale, with top speed around 40mph, but that's hardly the point of this type of model. At full power, it's crisp and responsive, and it penetrates wind better than I expected.

• Low-speed performance

Cruise is where the PBY shines. A 1/23-scale model isn't going to fly at true scale speeds, but it looks very nice at 2/3 throttle. Be forewarned: this is a small, short-coupled model, and it will tip-stall. During a turn at low altitude, the PBY snapped without warning, and at that height, recovery was not possible. Damage to the airframe was moderate, and the plane was quickly repaired. The lesson learned is that while this model flies well and looks beautiful in the air, it will snap if a turn is attempted at low speed. I got my best results keeping the speed up (say 2/3 to 3/4 throttle) during turns. You can safely reduce power clear back to idle in level flight (I like to make gliding, power-off, strafing runs), but be sure to apply power before climbing out or turning.

• Aerobatics

I prefer to fly my planes in a scale-like fashion, and I restricted the PBY to steep turns and split-S's. I'd avoid high-G maneuvers, since the wing mount wasn't designed to take unlimited loads. Spin recovery is not automatic; you'll have to apply opposite rudder to stop the spin and ease it back to level flight; abrupt pullouts will pop it right back into a spin. The plane is responsive and will look great flying figure-8s low over the water. All in all, it's a very pretty model in flight.

of the recommended hinge tape to install the elevators and rudder.

WING

This model features a very high-quality, sheeted-foam wing. The channels for the motor and servo wiring have been cut at the factory, the dihedral is molded in, and the trailing edge is sanded to a near knife-edge. The wells for the aileron servos and the slots for the motor mounts are routed, and the ailerons are also cut. Even the leading edge (LE) stock has already been installed and sanded to a perfect radius. My only criticism is that the wing is sheeted with 2mm (over 1/16 inch) balsa, which is a bit heavy for a model of this size. Using 1mm balsa would have saved about 2 ounces, but this wing is outstanding in every other respect.

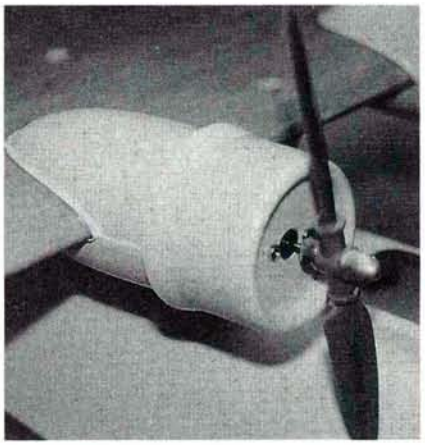
I cut the ailerons free and faced the bare foam with balsa using foam-friendly, thick, odorless CA. After a light sanding, I glassed the wing using the same technique as I used on the tail. Incidentally, glassing the entire 400-square-inch wing added about 1 1/2 ounces. I sanded, primed and wet-sanded the wing before proceeding with assembly. If you follow this technique, be sure to sand off as much of the heavy primer as you can; the wing should just have a "dirty" look to it.

I used two-sided foam tape to secure the aileron servos in the precut wells and made my own long Y-harness with servo wire and Custom Electronics* connectors. As with the rudder and elevators, I used Easy Hinges cut in half to hinge the ailerons. Hatches are supplied to cover the servos.

MOTORS AND NACELLES

The motor mounts are assembled, and they're simply glued into precut slots in the LE of the wing. Because the parasol wing is

(Continued on page 69)

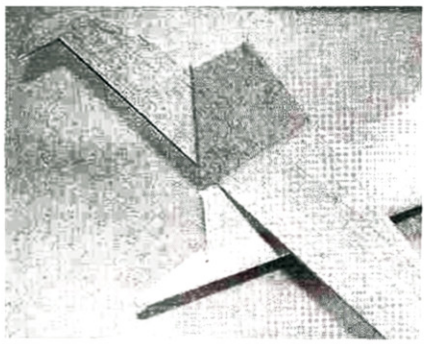


The cowls and nacelles are vacuum-formed of lightweight styrene. If you don't glue the nacelle halves together, you'll be able to access the motor by prying off the bottom.

(Continued from page 66)

mounted with 2½ degrees of positive incidence, the kit includes a 4mm spruce stick to prop the LE up while the motor mounts are glued into place. This is a nice feature, and it made this usually tedious step very simple.

At this point, I installed the motors with 2.5mm screws and wired them with



The tail feathers come assembled and already sanded to shape.

16-gauge, silicone-insulated wire from Cermark*. I suggest you glue the motors to the mounts with thin CA and accelerator so they won't fall out when you remove the mounting screws to install the cowls later on.

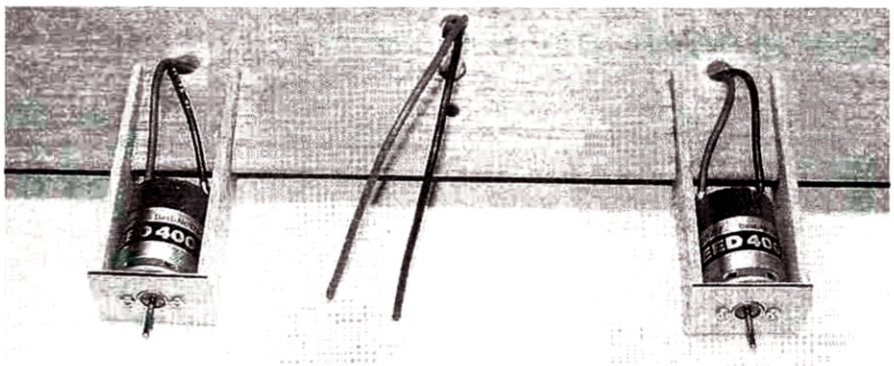
The cowls and nacelles are vacuum-formed of lightweight styrene. They're fairly thin, but given their protected position high on the parasol wing, this is a smart place to save weight. After cutting out the upper and lower nacelle halves, I test-fit them together around the motor mounts to see how much of the overlap I'd have to trim away. This takes a little time, but if you're careful, you'll be rewarded with a very tight joint between the nacelles and the wing. You can bond the upper and lower halves together with MEK, but it isn't necessary. The advantage of leaving them separate is that you can access the motors by prying off the bottom nacelle halves. Since electric motors seldom, if ever, need service, this is up to you.

To complete the assembly, I installed the cowls and secured them with the motor-mounting screws. Using the cowls for alignment, I glued the nacelle halves to the wing with thin, odorless CA. I recommend this over the suggested technique of mounting the nacelles with two-sided tape.

I assembled the vacuum-formed tip floats at this point, but it was easier to wait until the airframe had been painted to install them. The kit also includes vacuum-formed, non-functional wing struts, but these would produce extra drag, and I decided to omit them.

FINISHING

Given the Catalina's storied and varied career, there are nearly endless choices for color schemes, but I chose the early War camo of Lt. Howard Ady's PBY-5, which discovered Adm. Nagumo's fleet at the Battle of Midway. I applied two very light base coats of Krylon Dull Aluminum spray paint to the wing and empennage and then did the camo scheme with Floquil military paints using my Paasche* airbrush. The kit includes an excellent decal sheet, but since my chosen subject required early War insignias, I painted the markings with frisket film masks. Finally, I glued the observation blisters (the PBY's trademark!) into place with good old RC-56, and my P-boat was ready to fly. Total construction time was two weeks, and the ready-to-fly weight was 46 ounces with a 7-1400SCR pack. It was time to head for the field.



The motor mounts are simply glued into precut slots in the LE of the wing. The channels for the motor and servo wiring are factory-cut.

SUMMARY

Building the PBY was an absolute pleasure. Revised and expanded English instructions would be helpful, but the quality of materials and workmanship is exemplary. Flying the plane takes above-average skills, but I'd recommend this kit to any experienced pilot who has a warm spot for this beautiful old workhorse.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

Event host Rick Anderson with his huge, gas-powered Gyro Stick, which dwarfs his small direct-control model and his Gyrace.

GYRONUTS

These unique models are on the rise!

by JIM BAXTER

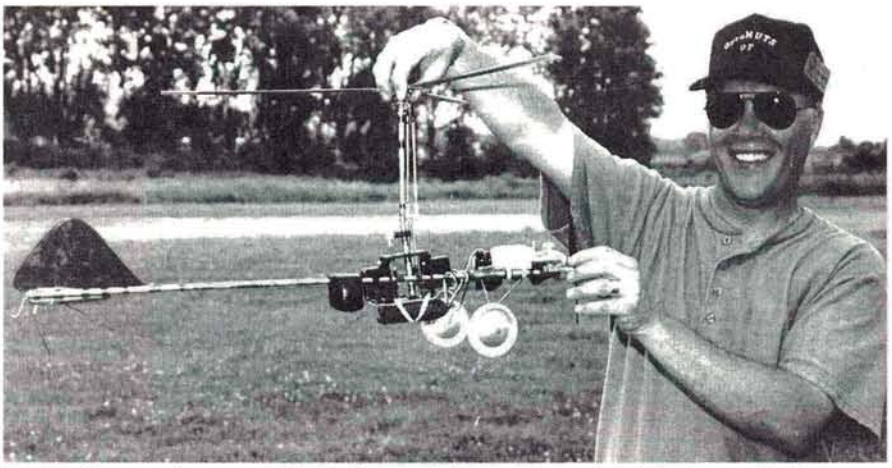
THE MOST SUCCESSFUL autogyro modeling event, especially in terms of technological achievement, was held this past summer in Martinsville, IN. Gyronuts '97, hosted by Richard Anderson, presented autogyro enthusiasts with a superb flying site, blue skies and a relaxed atmosphere in which to further investigate, demonstrate and enjoy all the rapid advancements made in our quest to keep model autogyros "on the rise." Gyro modelers from seven states and Canada were amazed at the variety, quality, reliability and, above all, the technical advancements made in just the past year in this narrow—but fascinating—field of model aviation.

In the past few years, our ever-expanding group of autogyro enthusiasts, known

Above: isn't this something! Hank Hinchman stopped by with his full-size N-1 Racer gyroplane. Hank's unique and colorful machine was something special for everyone to see and watch (Paul Noeth photo). Right: Rick Anderson's Gyrace; twin fixed rotors; 50-inch span; .35 engine.

on the Internet as the gyroNUTS, has continually solved one aerodynamic mystery after another in an effort to design, build and fly true autogyro models. Replacing a fixed wing with an unpowered rotating disk sounds simple; however, getting the blades to rotate, lift the model and fly in a stable manner is another matter altogether. What we gyroNUTS call a true autogyro is a model aircraft that does not employ helicopter mechanics or a powered rotor and has little or no fixed-wing area, just like the 1920s and '30s designs of Juan Cierva of Spain.

Gyronuts '97 will be remembered as the year of the direct-rotor-control model and the emergence of true autogyro models that average R/C flyers can construct and fly.



Paul Noeth amazed everyone with his tiny proof-of-concept experimental autogyro. Highly innovative, Paul proposes to not only tilt the rotor, but to also shift the rotor horizontally by servo control. Still under construction, unfortunately it was not ready for flight (Bruce Hoffman photo).

Steve Tillson's Kellet YG-1B; 48-inch flapping blade rotor; .35 engine.

The semi-scale Cierva models of Steve Tillson of Phoenix, AZ, and my tiny Suitcase Minnie models, featuring direct-servo tilting of the rotor for flight control rather than just rudder and elevator, were continually flown throughout the weekend to the fascination and delight of newcomers and visitors. To the surprise of many observers and fellow modelers, these models proved very stable and maneuverable, and they flew exceptionally well.

Participants and visitors were treated to the widest variety of models ever present at an autogyro fly-in: coaxial (two rotors, single shaft), twins (two rotors, extended horizontal shaft), 2-, 3-, and 4-blade rotors, single-blade teeter bars, and even a dual synchronized rotor Mixedmaster model, built and demonstrated by Bill Friedlander. We are still very much in the design-and-development stage, so there were a few mishaps, but not a single model was destroyed. Have we come a long way? You'd better believe it!

Bill Friedlander of Hudson, WI, delighted the group with frequent demonstration flights of his new twin-rotor Prairie Gyro—a quick, simple autogyro conversion he designed for Peck-Polymers* using a Prairie Bird 50 model airplane. Bill first demonstrated the model as a fixed-wing aircraft, then quickly removed the wing, replaced it with the twin-rotor assembly on extended booms (held in place with rubber bands) and launched it as a true autogyro.

Steve Tillson demonstrated his latest sport-scale model, a .35-powered Kellet YG-1B, another true autogyro featuring a 48-inch rotor and a full flying stabilizer. It was controlled in the lateral roll axis by servo tilting. Steve impressed everyone with the stability and grace of this model, for which he offers construction plans. Steve's venerable Cierva C.4, a 44-inch-rotor sport-scale model of his own design, completed several beautiful flights. His C.4 also features direct-servo lateral control of the rotor, along with a conventional rudder and elevator. Steve offers detailed plans for this model through the Autogyro Co. of Arizona*.

I flew several versions of my Suitcase Minnie, a small .15-powered, direct-servo-controlled true autogyro. This model has a 33-inch rotor, weighs less than 30 ounces, uses vertical and horizontal stabilizing fins but no rudder or elevator, yet is very stable and fully controllable. I affectionately call these models "Suitcase Minnies" because they're designed to be completely disassembled and packed in your suitcase for travel. Yes, I traveled to the fly-in with two of them in my airline luggage. Plans are available, and you can contact me at: www.ior.com/~jabax or E. 13003 Guthrie Dr., Spokane, WA 99216.

Our host, Rick Anderson, dazzled onlookers with several aerobatics demonstrations of his Gyrace twin-rotor model. Powered by a .35 to .45 engine and spanning 51 inches, the Gyrace is an excellent model for anyone interested in autogyros, and plans are available. Rick also brought (or should I

Steve Tillson launching his Cierva C.4 on one of its numerous flights. Steve's own design, it can be either hand- or ground-launched (Bill Friedlander photo).

say "hauled"?) his new bigger-is-better, twin-rotor Gyro Stick. Unfortunately, this model was not quite ready to fly with a 25cc weed-whacker engine ... would you believe it was underpowered?

Leon Wolfe of La Crosse, WI, a relative newcomer to the gyroNUTS, had a ball flying his Whistler. This 2-blade teeter-bar rotor model was designed by one of the visiting participants, John Kallend. The Whistler is an excellent single-rotor gyro, a delight to fly and capable of performing some aerobatics. Dr. Kallend flew to the flying site (a light plane field) in his full-size Mooney, unloaded his personal Whistler and to the cheers of the group, conducted several excellent flight demonstrations.

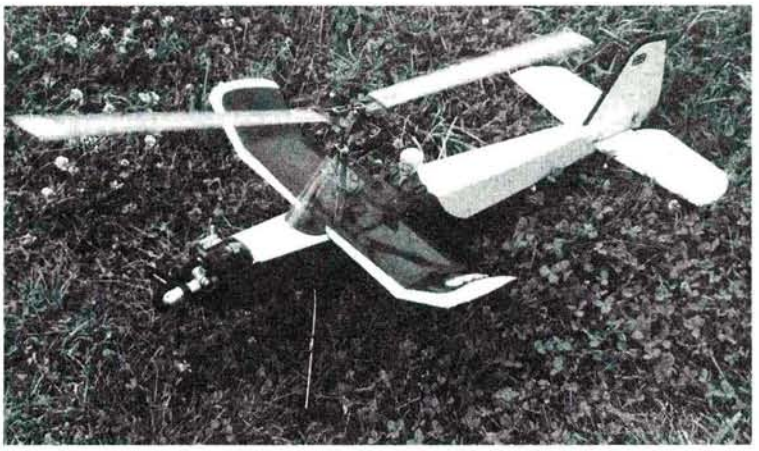
Bill Lehn of Dayton, OH, flew his original Gyrofalcon. This coaxial, dual-rotor model was the very first autogyro model I built and flew many years ago. A coaxial rotor has two rotors stacked vertically on a single shaft.

One of the highly technical surprises of the fly-in was the presentation of a radical new proof-of-concept model by Paul Noeth of Granger, IN. Paul's experimental ½A model features a fully articulated rotor mast and complete servo tilting of the rotor itself. The concept is to shift the disk horizontally while keeping the model level, and to tilt the rotor, when necessary, for flight control; this might eliminate the need for a horizontal stabilizer. This is a technical takeoff from the full-size RAF 2000 gyro plane, and it is a real work of art but not quite ready for flight testing. Paul's model weighs less than 21 ounces and sports a 26-inch rotor. Photos and details of this model can be viewed on the gyroNUTS webpage,http://outworld.compuserve.com/homepages/noeth.

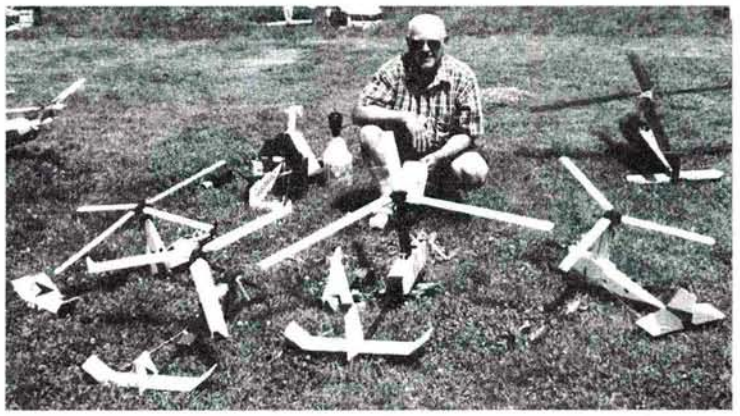
Michael Selig, well known for his low-speed airfoil research, stopped by to offer his expertise on rotor-blade improvement. Selig expressed amazement at the technical accomplishments of the gyroNUTS and the vast variety of models at the fly-in.

Throughout the weekend, it was evident that autogyro modeling is definitely on the rise and this trend will continue with the concentrated efforts of the gyroNUTS. We welcome you to visit the gyroNUTS Internet Web page, where information on building and flying these models is available, including a list of plans, etc. Additionally, we frequent the Compuserve Modelnet/autogyro forum, and the autogyro forum on www.RCOnline.com.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*



John Kallend's Whistler; 52-inch teeter bar; .42 4-stroke engine.



Jim Baxter shows off his collection of small direct rotor servo-controlled Suitcase Minnie autogyros. Ranging in size from .12 to .25, they can be completely disassembled and packed in your suitcase (Bruce Hoffman photo).

Clockwise from top left: the author and his Q-Tee gyro, a quick conversion to the ½A Q-Tee model aircraft. Powered with a .12 engine, it can be disassembled (even the tail fins are quickly removed) and features only direct rotor tilting for flight control (Bruce Hoffman photo). • Professor John Kallend performed several superb aerobatic flights with his original design Whistler. Many of the gyroNUTS present had built and flown one of John's venerable Whistlers (Bill Friedlander photo). • Bill Friedlander was excited about his successful Prairie Gyro, a .15-powered conversion of the Peck-Polymers Prairie Bird 50 model airplane (Bruce Hoffman photo). • Leon Wolfe enjoyed numerous flights with his Whistler. This was Leon's very first autogyro, and he recommends it for potential gyroNUTS (Paul Noeth photo).

Don't let the COLD get you down

by DAVE GARWOOD

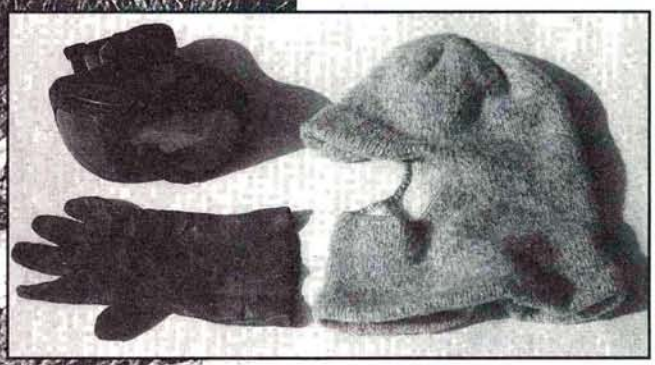
Enjoy the benefits of winter slope soaring

THERE ARE SEVERAL REASONS to fly when it's cold. For one, cooler air is more dense and provides better lift on the same hill and in the same wind than air in balmier conditions. You will experience a slight but noticeable increase in aircraft performance. For another, the summer crowds have thinned out at beaches and mountaintop flying sites, making your flying session a little safer because there are fewer sunbathers and tourists to hit in case of a mishap.

Additionally, the air is smoother at inland slope-soaring sites because the leaves are off the trees. The effect of upwind turbulence-makers is attenuated because the wind passes more easily through the bare branches and delivers more uniform air to the slope face. Further, agricultural activity is down, and we have greater access to farm field sites.

The most important reason: more flying time. If you add two months to each end of a typical

Lou Garwood with Gregg Goris' A-10 Warthog ready for launch on the slope, standing in snow-covered dune grass. Lou wears a hooded nylon jacket, balaclava and sunglasses covering his face, plus mittens, snow pants and boots.



Three key items for cold-weather slope soaring: ski goggles, balaclava and thin leather gloves.

PHOTOS BY DAVE GARWOOD

Steve Hinderks, proprietor of The Birdworks, wearing the ultimate in head protection, launches a Rubber Duck at the World Soaring Jamboree in Kennewick, WA.

temperate zone flying season, you'll be able to fly half again as many times in a year. I've flown sailplanes every month for the last nine years, and the winter stick time is mostly slope time. The keys to flying in cold weather are clothing preparation and a "can do" attitude.

PREPARATION

Remember that with the wind-chill factor, it's cold at the slope in winter. The solution is to dress for cold weather comfort.

Dress in layers. This strategy works because fundamentally, it's the trapped air that keeps us warm, not the cloth, leather, fibers or feathers in the garment's construction. Air's relative resistance to transmitting heat is the reason goose-down parkas and pink fiberglass insulation in houses work as well as they do. Trapped air holds in body heat. The air between layers of clothing adds to their insulating value, so layers of clothing are warmer than an equivalent thickness of a single garment. Further, dressing in layers allows you to adjust your personal body temperature by adding or removing layers to suit conditions. Let's discuss specific items of clothing for cold weather exposure.

Joe Chovan models the layered look at Lake Ontario. He's holding his own-design V-tail version of Joe Galletti's Foameron.

Head covering is important, as physiologists estimate that as much as half the heat lost from the body is radiated from the head, owing mainly to its rich blood supply. A knit watch cap works well because it covers the head and ears. A knit ski mask covers the face as well but may reduce your visibility. My favorite is the balaclava—a knit cap that's pulled down to cover the chin and neck and has openings for the eyes and nose. Mine has a short brim.

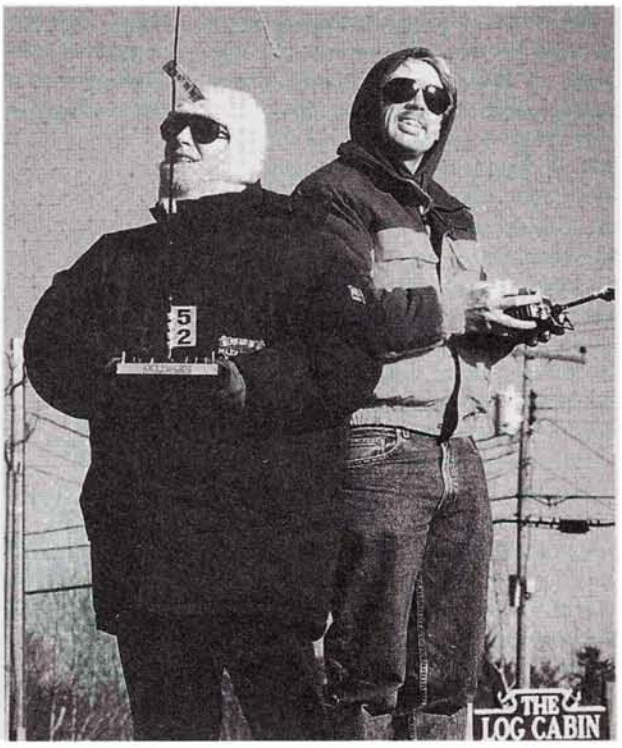
Eye protection in windy weather is important to preserve good vision because the cold increases tearing. Wear regular prescription glasses, sunglasses, safety glasses, or motorcycle goggles to protect your eyes. Ski goggles are a good choice, because their wraparound lenses and ventilation reduce fogging. I have a pair designed to fit over prescription glasses. The ski-goggle lenses are often soft and easily abraded, but replacement lenses for many brands are available from 1-800-PRO-LENS.

Upper garments are nothing special, but remember the layers. Cover your upper body with your favorite combination of long underwear, sweatshirts, sweaters, or flannel shirts topped off with a windproof jacket.

This last is the most important, I think, and my favorite outer upper garment is a hooded shell known as a mountain parka or "60/40 jacket" because it's commonly made of a combination of 60 percent nylon and 40 percent cotton. It's tough, windproof and slightly water-resistant. Interestingly, it provides almost no warmth on its own, but serves to keep the other layers working by shielding the wind. These jackets typically have several pockets that come in handy.

I also use a sports-type warmup jacket—a fleece-lined nylon shell. Flying buddies use hooded sweatshirts with denim jackets and Tyvec® coveralls. Select one with a hood, and it will provide a removable extra layer of protection for your head.

Mr. Mushroom and Mr. Stylish: Dave Garwood and Mike Lachowski fly from the parking lot of a secret site over the Gulf of Maine in November. Head protection from a balaclava or hooded sweatshirt is critical to comfort in the cold and wind (photo by Alex Paul).



Inset: Joe Chovan shows the usefulness of a hooded sweatshirt at Lake Ontario. Note the whitecaps on the lake. The plane is a Walter Bub design, the A-6 Intruder.

Dressed for the weather, Lou Garwood and Bill Lubert fly from an Atlantic Ocean coast dune in January. Balaclavas protect their faces from the wind, and boots protect their feet from the snow-covered frozen ground.

Lower garments. Do your legs get cold? Mine used to, before I got Gore-Tex® snow pants from a ski shop. Gore-Tex is wind- and water-resistant. Alternatives are Carhartt insulated overalls or a snowmobile suit. For less severe conditions, I like cotton sweatpants coupled with nylon wind pants.

Gloves are important to staying out in the wind for extended periods. A large variety of glove types is available from sporting goods, ski shops and Army/Navy stores. Some cover the palm and wrist and leave the fingers uncovered and some have flaps so you can extend or retract fingers. My favorites are thin leather surplus military flying gloves, and I've seen excellent thin rubber gloves with cloth liners available from SCUBA suppliers. Also consider transmitter mitts designed especially for R/C flying. Gloves can make the difference between flying and having to put your hands in your pockets.

Footwear is critical. You won't last long if your feet get cold. My preference is leather boots with two layers of socks: inside cotton, outside wool. Like gloves, many types of warm footwear are available. If you're susceptible to cold toes, look at electric socks, Thinsulate®-insulated boots and thick Arctic mukluks or snowmobiling boots. For wet conditions, take spare socks. Dry feet are happy feet.

With the right clothing, you can withstand a lot of cold weather and keep flying, especially if you have the right attitude.

ATTITUDE

A construction worker flying buddy said of being outdoors in cold weather, "Hey, I work out in it ... we ought to be able to fly in it," and loaned me a pair of Carhartt insulated overalls he wore on the job. Reflecting on his attitude, I started to feel like a wimp for not flying in the cold.

Sure, it's easy to conclude it's too cold to fly and that cold weather is "building weather," but you can build at night. When the sun is shining, get out and fly. You might be surprised at how good the flying is, and you'll certainly be impressed with your own toughness and stamina.

Slope soaring in winter can be as rewarding as during any other season, and sometimes better. To succeed at it, be prepared in the clothing department and think tough. Beat the cold! Bundle up and fly.

In snow we go! A Sig Ninja cruises past a pair of well-dressed New England slope flyers in January.

by HAL deBOLT

MORE "GOOD" HISTORY

LAST MONTH, WE DELVED into the history of probably the most famous R/C'ers, the Good brothers, and their model, Big Guff. We want to continue with this "Good" tale. The brothers competed in the '49 Nats with Big Guff and won again. If you recall, Bill was working in Syracuse, NY, and Walt was in Maryland. Perhaps the 600-mile separation brought an end to their close collaboration in R/C; Walt was the only one involved in R/C thereafter.

In the late '40s, R/C made solid progress, and more and more modelers showed skill at designing and flying R/C. New planes and systems came into vogue, and Walt realized that the Big Guff's heyday was past. Competition required increased agility; that plus other needs led to specialized R/C designs. Converted free-flight models would no longer do!

Walt took off a year to review the situation and develop what many consider the *first* all-R/C model. Walt showed up at the Nats with his new Rudder Bug and once more dominated the competition. The Rudder Bug was as different from Big Guff as an apple is from an orange.

It was obvious that much thought had been given to the need for single-channel, rudder-only flying. The Bug's size reflected the major advances in both engines and R/C. The Bug was only about two-thirds the size and weight of Big Guff. New tubes and relays and fewer batteries negated the weight handicap of previous radios. With the advent of WW II, distinct advances were apparent in the engine field. Lessons learned during the War resulted in even more impressive engines in the postwar period; .29s now produced more power than the first .60s! Improvements in both areas favored R/C; no longer was a large plane required to carry the previous heavy weight with barely sufficient power. A more realistic size was possible!

Less weight and more power dictated the Rudder Bug's reduced size. Walt's design still followed Charlie Grant's excellent design philosophy. The 6-foot wing retained a thick, high-lift airfoil, while the horizontal tail had a moderately thick symmetrical section. Grant's doctrine allowed the use of a relatively small vertical tail, which enhanced spiral stability while increasing rudder effectiveness. A high thrust line kept the "zooming" tendency when exiting turns and maneuvers to a minimum. If there were a shortcoming, it would be the use of a free-flight-style force arrangement; but a force arrangement suitable for R/C was yet to come.

Genial Dr. Walter Good prepares his TTPW Multi-Bug for another flight.

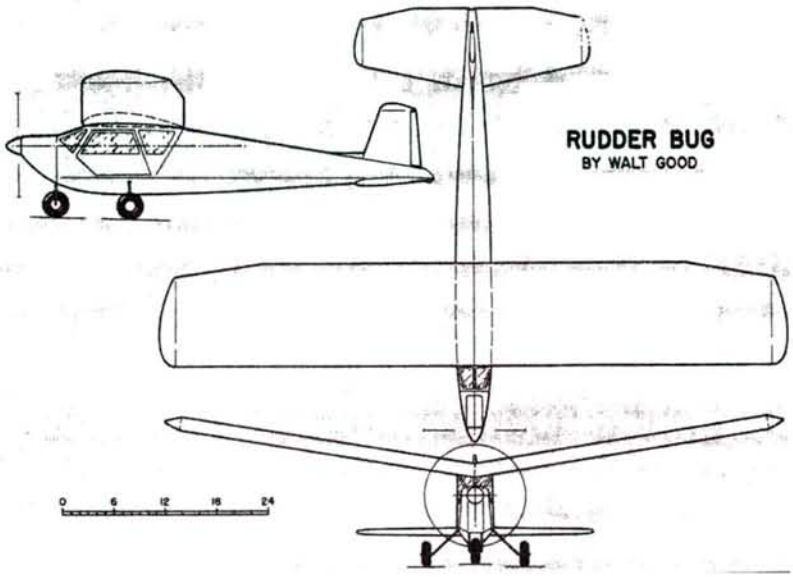
The use of tricycle landing gear to assist R/C takeoffs was probably pioneered by Jim Walker, and Walt realized its value. Walt once said that a side effect was about as nice as the improved takeoffs: the front wheel acted as a "bumper" during those "oops" landings, saving props!

Structurally, the Bug followed free-flight methods with the generous use of "sticks" and little sheet wood. The nylon covering provided the needed strength. Walt realized the need for radio accessibility by retaining the "side door," as featured on Big Guff.

As the name implies, the Rudder Bug was developed for rudder-only competition and did an outstanding job for newcomer R/C'ers of the era; many Bugs were seen!

Apparently, the Rudder Bug was never kitted, but Berkeley Models did produce a smaller version labeled the "Royal Rudder Bug."

After the Rudder Bug, Walt developed another smaller rudder-only design called the "Wag." It featured a deep "step" on the fuselage bottom to produce drag, which would hopefully prevent speed buildup while



Walt Good's 6-foot-span Rudder Bug was one of the very first R/C designs for rudder-only.

exiting maneuvers and on landing approaches.

In the R/C world, both of these designs were relatively short-lived. R/C was rapidly advancing beyond rudder-only, and multi-controls were on the horizon. More simplistic designs were appearing, and R/C kits came on the market.

The "Good" story would not be complete without mentioning Walt's Two-Tone Pulse-Width (TTPW) R/C system—his answer to the multi-control desire. The basis of the TTPW system was two separate audio signals. The carrier was modulated with two audio frequencies that were separated in the receiver and relegated to vertical and horizontal control. The transmitter had a "pulser" for each channel, arranged to vary the width of each pulse. If the center of the variation was neutral, then as the pulse was narrowed, the control could move one way; widening the pulse would move the control in the opposite direction. Because the amount of width pulse was infinite, there was potential for proportional action.

As with most pulse systems of the time, the control actuators were of the "Mighty Midget" motor style—one for rudder and another for elevator. Such a system was labeled "Pulse Proportional"—this in the heyday of reed systems! Unlike other simplistic pulse systems, there was very little control dithering with the TTPW.

A sign of the times was the complexity of the TTPW circuitry. With no transistors or integrated ciruits, the tubes needed a lot of circuitry and critical components to do the work. Walt published a TTPW how-to that caught the fancy of numerous R/C'ers. The complexity soon drew a nickname: "Too tough to peddle with!" I doubt if Walt will ever live that one down!

The TTPW brought another model design from Walt. He basically took the Rudder Bug, added elevators and other modifications suited to multi and called it the "Multi Bug." I should add that the Multi Bug is on display in the AMA Museum.

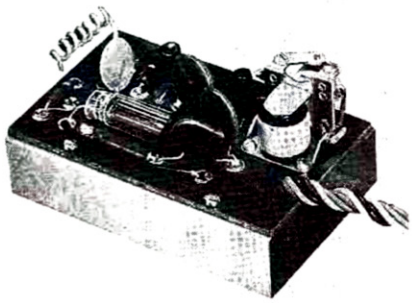
R/C advancements quickly brought "reed systems" onto the scene with (almost!) no limit to desired controls. These brought on ailerons, which soon changed the maneuver capability—no longer would rudder be sufficient. When asked what he intended to do about ailerons, Walt replied that TTPW was already very complex, and adding an aileron channel would be a bit too much. I recall that the TTPW Multi-Bug was the last of Walt's aerobatic endeavors, but he didn't hang up R/C! Now in his 80s, Walt still competes with R/C gliders but, as with most of us, his radio is from Asia!

We'll get back to your OT R/C place next time!

NATIONAL ASSOCIATION OF ANTIQUE RADIO-CONTROL EQUIPMENT ENTHUSIASTS

Is there a reader who is not aware of the Vintage R/C Society? You know, the many OT R/C'ers engaged in the preservation and flying of OT R/C models. The Society has been going strong for many years. (A new address for VRCS's Art Schroeder is 1418 Willow Creek Terrace, Spring Hill, FL 34606.)

Now it appears OT R/C has another organization, the National Association of Antique R/C Equipment Enthusiasts, championed by Gordon Case and associates. Apparently Gordon and fellow R/C'ers found opportunities to acquire OT R/C equipment, systems and such.



A typical early single-channel receiver. The glass tube is probably an XFG-1; a relay is on the right. That was it—a few capacitors and resistors!

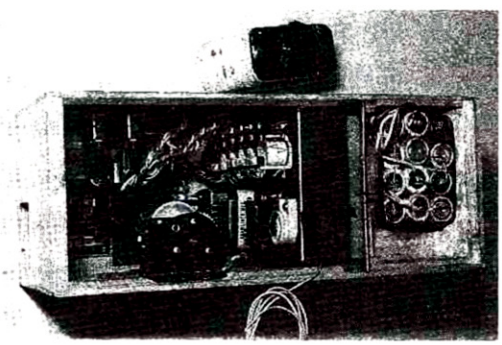
Dick Schumaker's R/C installation on his popular Liberty Belle. All that for just one control in those early days!

The National Association of Antique R/C Equipment Enthusiasts' objectives are to:

1. Act as a clearinghouse for enthusiasts and equipment.
2. Preserve antique R/C equipment in its original form.
3. Promote active flying of antique R/C models with antique equipment.
4. Provide information for OT R/C enthusiasts.
5. Provide a high-quality newsletter for all members.

The first issues of their newsletter entitled "Relay" are full of interesting antique R/C information. "Relay" even provides free advertisements for those who want to buy or sell antique R/C equipment. Well done!

Interested? Contact Gordon "Chuck" Case at P.O. Box 4108, Menlo Park, CA 94026.



Good example of the complexity of early reed systems: Bramco V receiver, multi servos and many batteries in a Live Wire removable R/C unit.

Thinking BIG

by GERRY YARRISH

A NEW COLUMN EXPLORING THE BIG PICTURE

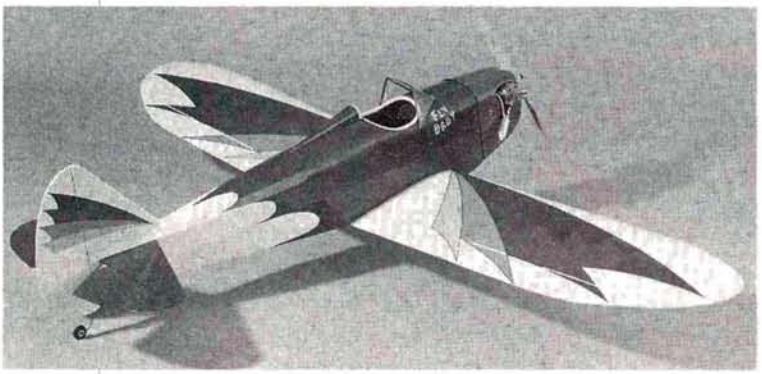
Let's face it, today big means really big, as can be seen here at an IMAA warbird rally. Over the years, the definition of what exactly is considered big has changed. It is, however, very easy to start building and flying big models.

Can you remember your first big model? What was its wingspan? For me, my first really "big" airplane was a Goldberg Sr. Falcon, back in 1970. It had a whopping, 69-inch wingspan and if memory serves me, I believe it had about 800 square inches of area. By today's standards, the size of the old Sr. Falcon is nothing special. Size is a relative thing, and today really big usually means huge.

The definition of big has changed over the years, and recently I saw this clearly. I was at an IMAA fly in and had brought along my Hangar 9 ARF Cub and Ziroli Stearman PT-17. As I was setting up my tent, someone came by and commented on how small my 80-inch Piper Cub looked compared to the rest of the models. Boy, how times have changed.

The International Miniature Aircraft Association (IMAA) has had much to do with the popularity of big R/C, and many modelers are stepping up to the 80-inch and larger formats. A trip to almost any R/C flying field today will yield at least one giant-size model. Plans are now available from many sources for truly gigantic models, and events such as the TOC and Top Gun bring very large models together for competition.

Because of this continued interest in building and flying large models, we've decided to reintroduce a column that addresses these big issues.



Here's a logical starting point; the new Dynaflite Fly Baby. At 84 inches, the model is big but not gigantic. No retracts and simple in design: you can't help but succeed with this one.

Every other month, we'll look at gasoline engines and other big bore powerplants: we'll highlight models and events; and we'll discuss new big bird products. I'll also touch on construction techniques and materials that I hope you'll all find useful whether you're a big bird builder or not.

So far I have not used the words "giant scale." My intention with "Thinking Big" is to address sport models as well as scale models and to talk about IMAA legal models as well as those with 79-inch wingspans (and maybe even smaller). If this brings letters of disapproval from you dyed-in-the-wool IMAA'ers, I'm sorry, but this column is intended for the sport modeler. I'd like to start right now and ask for any questions. If you are a newcomer to big and giant-size models, then I'd like to hear from you.

A NEW BABY

While on the subject of just starting out, if you're in the market for a first-time big bird, why not consider the new Fly Baby kit from Dynaflite*. Though I

Below: now this is a big Extra! Built by Jacques Lapointe of St. Georges, Quebec, Canada, the 50-percent scale Extra 300S has a wingspan of 13 feet. Left: a close-up of Jacques' Extra's tail surfaces shows serious attention to detail. Note that the pushrods are made of metal tubes, with heavy-duty ball links for attachment points.

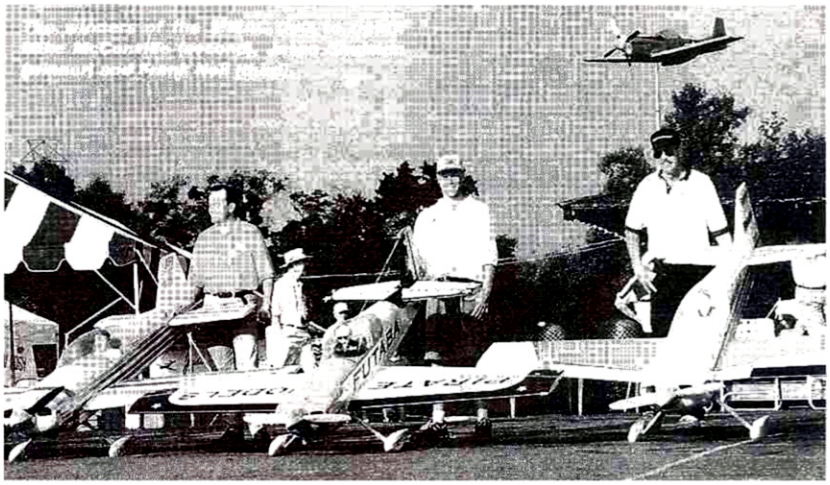
have not yet built or flown one, I have looked inside the new kit, and it looks very promising. The plans are CAD drawn, and the quality of the wood is good. The plywood is die-cut and very clean in appearance (no die-crunching). Being ¼-scale, the Fly Baby has an 84-inch wingspan and the suggested weight is 11 to 13 pounds. With an area of 1,059 square inches, that equates to a loading of about 26.3 ounces per square foot (at 12 pounds); good numbers for a first time 7-footer. The cowl is typical two-piece, vacuum-formed plastic (split vertically), and the kit comes with basic hardware and stout, bent music-wire landing gear. Personally, I would slap a Saito .91 4-stroke engine in this one, but you could just as easily power it with a .90 2-stroke or a 23- to 25cc gasoline engine. I'll bet we'll see a lot of these models at the local flying field in the coming season.

Here's Jason's CAP in a hover just inches off the ground. Nothing like power!

SHULMAN SUCCESS

I just got some information from Leon Shulman about his grandson Jason, who won the 1997 Masters World Aerobatic Championships (MWAC). Held at Hartness Field in Greenville, SC, the MWAC brought together 21 of the leading R/C pilots to compete at the same site that hosts the annual Joe Nall IMAA fly in. As with the Las Vegas Tournament of Champions, the MWAC has three segments of competition; the "Known" pattern, the "Unknown" pattern and the very popular "4-minute Free Style." Scoring is based on 40 percent each for the Known and Unknown segments and 20 percent for the Free Style.

New maneuvers, known as 3D aerobatics, are all the rage now in giant-scale aerobatic competition, and the MWAC was no exception. Rolling loops, slow-speed inverted outside loops, and low-level hovers (torque rolls) are the norm. When the dust cleared, Jason had won his second consecutive MWAC. Mike McConville came in second, and Frank Noll was in third place.

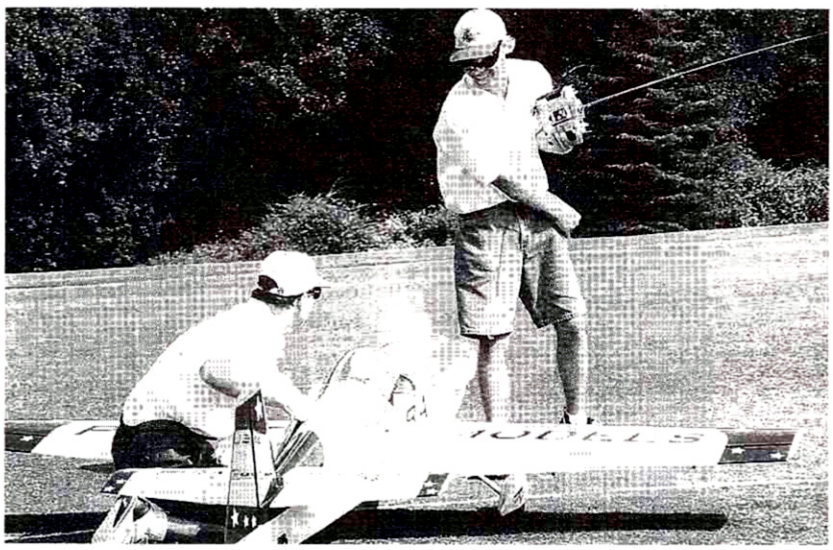


Jason's aircraft is a Pirate Models* 37-percent scale CAP 232 powered by a 3W* 120 twin-cylinder engine swinging a 28x10 Menz "S" wood prop. Jason's 35-pound model is made of lite-ply, balsa and foam and has a wingspan of 107 inches. As can be seen in one of the photos, Jason has no problem bringing his CAP down on the deck in a hover. I wonder how many bent rudders do you have before you get this good?

HALF-SCALE EXTRA

Some guys just do it right when they build an airplane, and Jacques Lapointe of St. Georges, Quebec, Canada, did so in a big way. I met Jacques a while ago at the Glens Falls, NY, Balloon Festival, where he was flying with the Master Flyers Air Show Team. When I saw his big Extra, I was blown away. Jacques' 50-percent Extra 300S is a modified, Aerotech R/C Models* kit, and it's powered by a 3W 240 B4, 4-cylinder (20hp) engine. The engine spins a 34x12 prop and produces about 110 pounds of static thrust. The wingspan is 13 feet and the model has 4,363 square inches of wing area. With an all-up weight of 74.5 pounds, the wing loading is a very respectable 39.5 ounces per square foot. Construction time was around 1,200 hours. I think you'll agree Jacques' time was well spent.

Well, that's about it for our first time out, please feel free to write to me with any questions and comments at *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877, or via email at: gerryy@airage.com. See ya.



Jason Schulman starts his 3W-powered CAP 232 on his way to winning his second Masters World Aerobatic Championship.

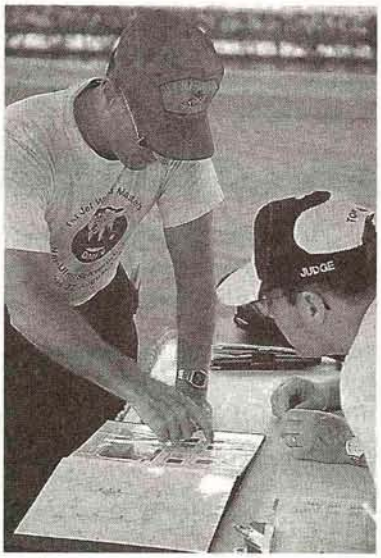
**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

by BOB UNDERWOOD

UNDERSTANDING THE BASICS

To place at Top Gun, you need to understand the "psychology of scale." The author (right) is awarded a trophy for Designer Scale by Top Gun organizer Frank Tiano. Sam Wright, the voice of Top Gun, is on the left.

THE MAJOR portion of this month's offering shares some of the insights I gained from a conversation overheard at a past Nats between a scale contestant and the static judges. The crux of the conversation was simple, though not particularly short: the contestant's static score had been chopped a few points for something the judges felt had been incorrectly presented. I was not privy to the entire discussion, nor did I view the scale presentation, so I cannot comment on the validity of either side of the debate. It did, however, cause me to think about what I refer to as the "psychology of scale." Obviously, my comments are my opinion and are therefore subject to *your* judgment. Additionally, while what follows may be more closely linked with the competitively oriented scale modeler, it does follow through for everyone building a scale model.



Make sure your documentation is clear and accurate. Here, competitor Garland Hamilton shows his documentation book to Top Gun judge Bob Curry.

FEET TO THE FIRE

If your personality and response to criticism runs to confrontation, then scale is probably not your best choice for a modeling activity. Remember that everything you present to the judges, static or flying, results in a subjective judgment. Of all the aeromodeling events, scale is the only one in the book that is given two separate scores, and they are *both* subjective. If you can't handle the fact that someone else may not view your product as you do, then find another niche in the hobby/sport.

Judges are called that because they must make a "judgment." A judgment call is never wrong. If an umpire states "You're out!" because he saw or *thinks* he saw the ball in the first baseman's glove *before* you touched the base, he is correct and you are out. While you may not share the same point of view on the call, the fact remains that a judgment was made. Notice that we have not discussed the *quality* of the judgment call, nor have we considered the presentation made by the contestant that resulted in the judgment. It is true that some calls may be the result of an interpretation of the rules. Those are, of course, open to debate.

STUDY TIME

In scale modeling, the time spent preparing for the execution of the project and the methods of presenting it are directly proportional to the score received. Scale columns have continually stated, "Don't begin the project

If it doesn't fly, it's not an airplane! Here, Bob Underwood's Hiperbipe takes to the skies at a recent Top Gun.

until you have all the documentation you need." This *cannot* be emphasized enough. Looking for information to prove the accuracy of what you've already built is generally a lesson in futility.

The second part of study time is making certain that what you present clearly reveals the model as accurately as possible. Don't muddy your static presentation with various references, such as using a drawing for one aspect of the judging but not another. I have seen presentations with as many as four 3-views, with suggestions to the judges that portions of each be used. The concept may be crystal-clear to the competitor, who spent years sorting out all the details of the photos and drawings. But what about the poor judge who has only 15 to 20 minutes to try to understand the pieces *and* judge the model?

AIRPLANES FLY!

If it has never flown, it is simply a pretty "thing" to be displayed! Now, there's nothing wrong with that concept, and the product may be excellently executed and deserve adulation. But it isn't an airplane until it flies! This is the very reason that AMA team scale exists now unofficially and, next cycle, officially. Some modelers become so emotionally involved in the research and construction of a model that they cannot bring themselves to trust it to the fate reserved for it, the uncertainties of the air and their own skill level. The model must be viewed as nothing more than a pile of "stuff" that's neatly, cleverly, and precisely packaged to resemble a larger pile previously assembled. It's not your life! It's not a member of your family! If you cannot face the fact that it may reduce itself, either by structural failure or someone's lack of skill, to a pile of "stuff" no longer neatly packaged, then find another outlet for your creative skills. More often than we care to think, it's not *whether* they will crash, it's *when*!

PACE YOURSELF

Running track, even beyond my high school and college days, helped me develop—or at least appreciate—a sense of pacing. If you go out too fast that first quarter, you wind up watching the backs of others in the last quarter. The same is true in scale modeling. First, ease into scale as an adjunct to your sport-

PANEL LINES ON METAL-COVERED AIRCRAFT

I'd like to pass along a specific technique: panel lines on metal-covered aircraft, using 1/64-inch tape. The steps are simple.

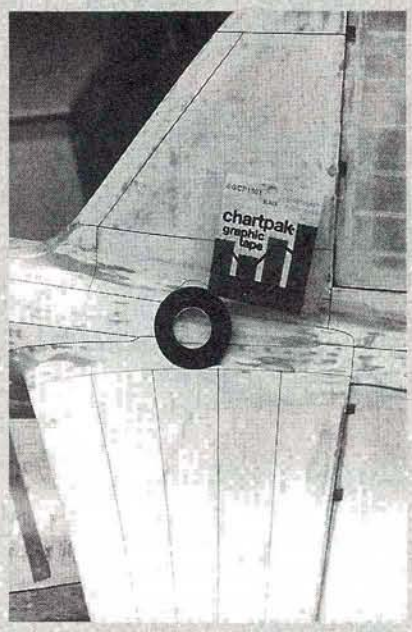
1 Prior to spraying primer, mark where the lines go on the aircraft. A light pencil line will work.

2 Lay the 1/64-inch-wide tape on the line. A little tension will help to keep the wiggles out, but don't use too much because the tape will pull back. This is especially a problem on curved sections, since the tape will shrink and pull away from the surface.

3 Spray your primer coat, laying up extra against the sides of the tape.

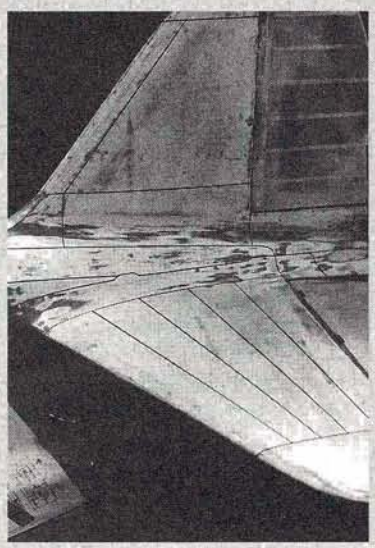
4 Sand ever so lightly with 320- or 400-grit sandpaper until you reach the tape surface.

5 Remove the tape. This may be the toughest part because some primers may attack the crepe tape and its adhesive, so pulling the tape off may be difficult. If that proves to be true, then use the pointed end of one of the miniature files and clean out the slot. Be careful not to puncture the surface underneath.



Chartpak graphic tape works well in this application. Rivets and aluminum tape hatches will be applied after the primer has been applied and sanded.

6 Paint! You can then go back and enhance the slot with the file. Use a light touch!



The 1-ounce cloth is filled and the 1/64-inch tape is in place. The next step is to shoot the primer. I use K&B* brand.

An alternate plan is to eliminate step 5 and leave the tape; however, be prepared for two concerns. First, the panel line will be wider and more prominent. It will also appear much more uniform—something not often seen on full-size aircraft. They won't look raised from 15 feet away—just more prominent.

The tape can be obtained from office-supply stores. Two brands used to be available. The brand called "Zipaline" may no longer be available in 1/64 inch. I recently purchased some called "Chartpak—Graphic Tape." The number on the package is BGCP 1501; it's 1/64 x 648 inches. One last thought: work diligently at preventing the loose end from flapping back on the roll because if it does, you won't be thinking happy thoughts when you try to locate it! Line away!

modeling activities. Jumping into the deep water to learn to swim *may* work, but more often than not, you swallow a lot of water in the process and it isn't fun. Keep your aeromodeling fun! Enhance your flying skills with an old faithful sport model. Early on in my scale competition, I enjoyed an edge because of my background in disciplined pattern flight. I lost that edge when administrative modeling activities took away my flying time. The only way to compensate was to enhance my building skills. What is needed is a balance of both.

Second, give careful consideration to your selection of models. Assess your skill level and choose scale models that reflect those skills. If you're not the best at putting on the final finish, don't choose a fancy subject that has four colors and is filled with fine lines and frills! If you have problems keeping one engine set correctly, then a B-36 is probably not a good choice!

IN MEMORIAM: Bob Wischer
October 12, 1915 - November 24, 1997

Sadly, I must report the passing of Bob Wischer. It's impossible to relate the history of scale aeromodeling without interjecting Bob's contributions both nationally and internationally. He was a consistent winner at the Nats and World Championships for many, many years. His flawless building techniques and steady, realistic flying made him a formidable competitor. It is interesting to note that the last contests he flew in resulted in wins in the newest R/C scale classification, "Designer."

Bob epitomized the concept of scratch-builder. He carved his own flying propellers, stripped his balsa stock and developed unique processes for simulating details on aircraft. A classic story occurred as he assisted me in presenting a modeling forum at the EAA convention. When I was asked to define "scratch-building," I answered, then turned to Bob and asked for his definition. Without a moment's pause, he replied, "Grow your own balsa tree!" While the audience treated his answer as facetious, I realized it wasn't far from the truth for Bob.

Bob's success was a team effort because you never found him without his wife, Dolly, at his side. His contributions in representing the U.S. scale community as a member of the FAI CIAM subcommittee, his volunteer work at world championships and conventions and his impressive list of competition victories will continue to provide inspiration for scale aeromodelers. Our love, our prayers and our support reach out to enfold Dolly and the family.

THERE'S GOT TO BE A REASON!

Typically, there are three basic reasons for building scale models. First, most modelers want something that looks "real." That feeling may result from a conscious desire to emulate something of great interest or importance to them (the jet they flew in Korea, for instance). It may also suggest a subconscious desire to produce something their friends will not look at as a "toy airplane."

The second reason may well be a carryover from their regular occupation or profession. An aeronautical engineer, pilot, tool-and-die machinist, artist, draftsman, etc., finds scale modeling, especially scratch-building, to be a natural extension and outlet for his creativity. In many cases, the hobby/sport and occupation/profession enhance each other quite nicely.

Last, you may find scale modeling to be an outlet for a specific career frustration. For instance, as a teacher, I was always frustrated to come to the end of a school year, watch 30 youngsters depart and realize that there was no concrete way to measure my impact on them. I could never see the results of my work. For that reason, I envied the bricklayer and carpenter. When their task was complete, they could step back, point to the wall or building and say, "There! That is a product of *my* hands!" My scale models fill that need for me, for, when they are completed, I can point to them and relate that they are a product of *my* hands!

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

by LARRY MARSHALL

RELATING GLOW AND ELECTRIC POWER

WHEN GUYS who are flying glow planes get interested in the possibilities of electric flight, they have many questions. One of the first, and the one that's hardest to deal with, is "How do I relate electric motors to cubic inches?" The reason the question is so difficult is that, well ... you can't. What answer could be more frustrating than that? I hope, with some explanation, I can take the sting out of that realization. My goal here is to direct some attention to better questions that will assist experienced modelers in applying their experience with other power systems to electric flight.

Electric motors come in all shapes and sizes, and the numbers on them don't relate well to their potential. From left to right: 1) Graupner Speed 400 ferrite motor, 2) Graupner Speed 500 ferrite motor, 3) Astro Cobalt 05, 4) Astro Cobalt 25, 5) Astro 020 brushless motor, 6) MaxCim 15Y brushless motor.

What is necessary to compare glow engines to electric motors (or any two things, for that matter)? First, we must understand clearly how each thing functions and how variables associated with each thing (in this case, motors and engines) relate to one another. Second, we need a common currency, relevant to the comparisons we want to make, so that we can actually compare systems. Sounds simple enough, right? But notice that under the best of circumstances, you must already understand electric motors before any such comparison can be done. My point is that this comparative approach is not a shortcut to understanding electrics; it actually requires more knowledge than simply learning how to match electric motors to airframes. But let's continue investigating this approach, as some other important points can be made.

Let's see how simple it is to "understand" power systems by looking at the system you already know—the glow engine. Most people talk about glow engines by referring to their displacement. A .60 is "bigger" than a .40; a 1.20 is smaller than a 1.50. Obviously, in the physical sense, this is true. But what about performance? How much of your understanding of glow engines is truly captured by such comparisons? I submit that the answer is—very little.

For instance, let's think about .40- to .45-size glow engines for a moment. Specifically, think about an O.S. .40FP sport engine, a YS .45 on a pipe and an Enya .41 4-stroke. Those who know these engines will realize several things: first, they vary considerably with respect to their power production; second, they differ in the way in which they are best used to convert power to thrust. The .40FP will be best when spinning a 10x6 prop about 11,000rpm; the YS .45 will be screaming and much happier spinning in the 14,000rpm range; and the Enya .41 will be best when spinning a somewhat larger prop at 8,500rpm.

I present all this to make two points. First, cubic inches don't really predict much, and there's more than just the engine to consider when determining how much useful thrust you're going to get from a power system. So, simple cubic-inch numbers that we think tell us a lot about engine power aren't as predictive as we might have believed.

Trying to understand the variation in electric motors is even "worse." I put that in quotes because what we find when we *do* understand electric motors is that those things that initially confuse us end up being cherished, once we understand them. You see, with electric motors, you can emulate the performance of that .40 sport motor, the hot .40 on a pipe, or the high-torque virtues of a 4-stroke with a single motor. Further, the flexibility goes in another axis as well: you can get the same motor to act like a .25 or a .60. For instance, an Astro Cobalt 15 motor on 10 cells will spin a 7x6 prop in such a way that you'd have a hard time telling the thrust production from that of a good .15-size glow engine. But take that same motor, stick a gearbox on it and add a few cells, and you'll be spinning a 12x8 prop as though it were attached to a Saito .54 4-stroke.

So ... what do we do?—two things, in my view. The first is to use the one thing that both glow and electric motors have in common—the prop—to let us translate what we know about glow engines to electric motors. We know that we can fly a ".40-size" plane pretty well by spinning a 10x6 prop at 11,000rpm (sport 2-stroke) or by spinning a 12x7 prop at 8,500rpm (sport 4-stroke). So doesn't it stand to reason that if we do the same thing with an electric motor, we can fly that same plane? I think so. We can't compare glow engines to electric motors, but we can use our knowledge of propeller performance generated by any power source to gain an understanding of what electric motors can do for us.

Still can't see how? Well, here's a hint, and we'll get back to the basis for it later. You can calculate the number of watts being absorbed by a propeller. When you do this, you find that our .40-size plane is being flown using 420 watts (with the 2-stroke) or 470 watts (with the 4-stroke). (See the power absorption table on page 99.) And this is where the electric motor world shines; it's easy to guesstimate the watts going to the prop from any particular power system.

If you've stuck with me this far,

you're probably ready to swallow this bitter pill. Just as you had to learn about glow engines—what they'll do and how they work—so you'll have to learn something about electric motors if you want to have sufficient knowledge to assemble effective electric power systems. In fact, at this point, I should launch into a discussion of Kv, Io, Kt and Rm variable definitions, as these parameters actually define any electric motor. But I promised you last time that we could get into electrics without having to be a mathematician, and so it shall be.

THE BASIC BASICS OF ELECTRIC MOTORS

Before we can talk about selecting power systems, even using simple rules of thumb, we need to understand some very basic things about electric power so we have the words and knowledge necessary to talk about and make our decisions.

I mentioned watts earlier. A watt is the unit of electric power in the same way that horsepower is used when discussing internal combustion engines. You get a watt by moving electricity through a device that can convert it to power. That movement of electricity is described by the term ampere (amp), and the force that causes it to move is the volt. We can describe the relationship between these parameters with the simple equation *Watts = Volts x Amps*. The most important thing to appreciate is that you can get watts by using lots of volts and few amps or few volts and lots of amps. For example, if you want 420 watts (to fly our .40-size plane), you can get it using 7 volts and 60 amps, 21 volts and 20 amps, or any other combination you might choose.

Making the decision about which combination to use—and, thus, what sort of electric motor you need to buy—is determined by some other pretty basic things. This gets us awfully close to having to deal with that math I said we would avoid so, for the moment, without my trying to explain, please accept these axioms:

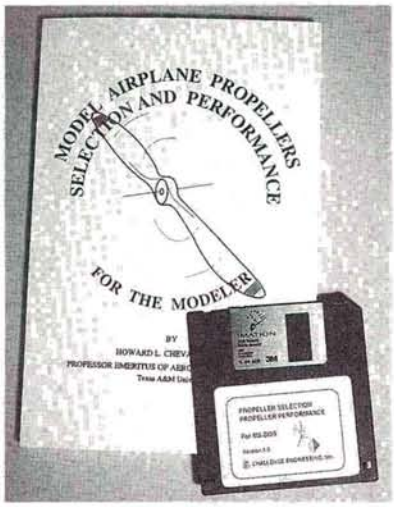
1. *Each Ni-Cd cell will produce 1 volt under typical electric flight loads.*
2. *The rpm of the motor will be directly related to the number of volts attached to it.*
3. *Current (amps) will directly affect the size of prop that can be spun at a particular rpm.*
4. *Current being dispensed by a set of Ni-Cds will be inversely related to the duration you'll get from the power system. It's more complicated than this due to interaction between these effects, but let's ignore that for now.*

So, what does all that mean? Well, there's nothing like an example to make a point. Let's look at the two ways to generate 420 watts.

Example One (7V and 60A): With this setup, according to the simple rules, you'll need 7 Ni-Cds (standard cell size these days is a 2000mAh cell, which weighs about 2 ounces). At 60A, these cells will give you 2 minutes of full throttle duration. Notice that you're also hauling 14 ounces of battery (7 cells x 2 ounces per cell). You'll end up spinning a relatively large propeller at a relatively low rpm.

Example Two (21V and 20A): With this setup, you'll need 21 Ni-Cds (42 ounces). Using the same logic as in our previous Example, you'll get a full-throttle duration of 6 minutes. Relative to example one, you'll be spinning a smaller propeller but it will spin a whole lot faster.

At this point, I hope it's becoming clear that selecting an electric motor for your modeling project is really a matter of answering two basic questions. They are: "What is the power requirement of my project?" and "What sort of propeller performance do I want to convert the power to thrust in such a way that the plane flies the way I want it to fly?" If you think about it, these are the same two questions we need to answer whether we fly electric-, glow-, gas- or gerbil-powered models. The difference is that for glow power, the kit box provides the answer to the first question and the engine instruction manual provides a very narrow range of props that answers the second question. Thus, most modelers are simply not used to having to ask themselves these questions. Next time, we'll start trying to answer those questions for electric power.



PROPELLER INSIGHTS

One thing that could get you started on the road to addressing some of those questions is to get your hands on a copy of Howard Chevalier's new book, "Model Airplane Propellers: Selection and Performance." Howard is an emeritus professor at the Department of Aerospace Engineering at Texas A&M University. This background shows in his books, as they are not only authoritative and jam-packed with good information about aerodynamics, but they are also written in such a way that it's clear that he has been a teacher most of his life and understands how to connect to those of us who struggle a bit with the concepts.

This propeller book is no exception, and if you read and understand its 177 pages, you'll not only understand how propellers work but you'll also understand and be able to make wise propeller selection decisions that will improve the flight of your aircraft regardless of power system and will really be a big help if you fly electrics. In fact, Howard supplies a series of programs that run on any PC that help you do just that. I'm not sure of the distribution of this book, as it has just been released, but Howard's other book is available through New Creations R/C—(409) 856-4630—so I assume this one is as well. If it isn't, check with The Sheraton Group on availability at 1722 Broadmoor, Ste. 105, Bryan, TX 77802; (800) 671-0776.

EASY, LARGE-PACK MAINTENANCE

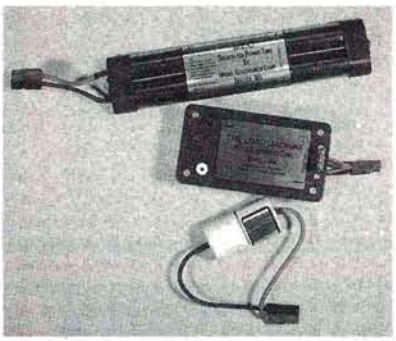
One of the problems that electrics flyers face when flying larger airplanes is that of pack maintenance. It's not a major

problem but it's a problem nevertheless. When you wire a lot of Ni-Cds in series, there is potential for them to become unbalanced; that is, they don't charge and discharge to and from the same voltage points. Further, once they're wired together, it's not really easy to find a cell that's performing poorly.

Model Electronics Corp. (MEC)* seems to have an answer and has released a line of Solderless Power Tubes that allow the user to easily dump the cells out on a table and test each one individually using the MEC Single Cell Holder and the MEC Load Machine, which puts a 30A load on the cell.

The system is easy to use. The Solderless Power Tube consists of a clear plastic tube with two black end pieces that are held in place with a threaded rod that runs the length of the pack. You simply drop the cells into place and tighten down the nuts on the threaded rod. They are available in sizes from 2 to 12 cell lengths. Ganging them together, as is typically done with conventional packs, allows the creation of a battery of any size.

If you want to test your Ni-Cds or to balance your pack, you can dump the cells out on a table and place them, one at a time, in the MEC Single Cell Holder and wait as the Load Machine takes the cell down to 0.9 volt. The Load Machine has sockets so that you



The MEC Single Cell Holder and Load Machine.

can monitor the activity using a standard multimeter and get a fairly complete assessment of the performance of each cell while you're at it. Any cells that show unusually low voltages under load can be replaced. Then, when you reassemble your pack, all of the Ni-Cds will start a charge cycle at the same voltage.

If there is a potential problem with this approach to pack creation it would be the potential for extra resistance due to the friction contacts (as opposed to soldered contacts) between the cells. Often, such solutions result in oxidation that results in a degradation of performance. I don't see any problems with the brand-new system I have, but thought I'd ask Pete Peterson of MEC about the oxidation after extended use, since Pete is something of a fanatic when it comes to getting the most out of his systems. He told me that he has been somewhat surprised that he doesn't end up with some losses, but that he hasn't experienced any. He did say that he dumps the cells out once in a while and cleans the contacts with a Scotch-Brite pad "just in case."

There is a small weight increase, but in my mind, this is insignificant when dealing with a large battery in a large electric airplane. My 10-cell solderless pack weighs 21.9 ounces, whereas the conventional, soldered, 10-cell packs I have weigh 21 ounces. Thus, for a 20-cell pack, you may add almost 2 ounces to the aircraft, but such aircraft typically weigh 9 to 10 pounds, so this 2-ounce difference isn't going to affect the flight characteristics of the aircraft; the benefits of proper maintenance, however, will. If you'd like more information, contact Pete Peterson at Model Electronics Corp.

Power absorption (in watts) by propellers of different sizes and at different rpm.
746 watts = 1 horsepower.

Dia.	Pitch	RPM						
		6,000	7,000	8,000	9,000	10,000	11,000	12,000
7	6	16	26	39	55	76	101	131
8	6	28	44	66	94	129	172	224
8	7	33	52	77	110	151	201	261
9	6	45	71	106	151	207	276	358
9	7	52	83	124	176	242	322	418
10	6	68	108	162	230	316	420	546
10	7	80	126	189	269	369	491	637
10	8	91	144	216	307	421	561	728
11	6	100	159	237	337	462	616	799
11	7	117	185	276	393	540	718	932
11	8	133	212	316	450	617	821	1066
11	9	150	238	355	506	694	923	1199
11	10	166	264	395	562	771	1026	1332
12	6	141	225	335	477	655	872	1132
12	7	165	262	391	557	764	1017	1320
12	8	189	300	447	637	873	1162	1509
16	6	447	710	1060	1509	2070	2755	3577
16	7	522	828	1237	1761	2415	3215	4173
16	8	596	947	1413	2012	2760	3674	4770
16	9	671	1065	1590	2264	3105	4133	5366
16	10	745	1183	1767	2515	3450	4592	5962
16	12	894	1420	2120	3018	4140	5511	7154

FEEDBACK

I want to thank all of you who wrote in support of this new column. Those who have written have suggested that I talk about setting up power systems, differences between electric motor types, how to build light electrics, how to do successful conversions of glow kits, how to set up multi-engine electrics, and many other interesting and important issues related to electric flight. Those subjects are now on the "to do" list, so we'll get to them.

I encourage you to send me photos and info on your pride-and-joy electrics as well. Good examples (with pertinent data, e.g., weight, wingspan, wing area, power system) of electric aircraft that are flying on a regular basis are an important part of any electrics column, in my view. The more variety I have to choose from, the better I can provide sufficient examples to serve as references for readers' new projects. Of course, I also encourage a continuation of your comments and criticisms of this column. You can reach me at larrym@airage.com and at 100 East Ridge, Ridgefield, CT 06877-4606.

**Addresses are listed alphabetically in the Index of Manufacturers on page 126.*

LATEST PRODUCT RELEASES

SIG MANUFACTURING CO. INC.

Kadet LT-25

This model features gentle flying characteristics and a light wing loading for slow flight. The kit comes with CAD-drawn plans, CNC-laser-cut parts, shaped leading and trailing edges, ailerons, rudder and elevator; photo-illustrated instruction book; formed aluminum main gear; and a complete hardware package. Specifications: wingspan—63 inches; fuselage length—50¾ inches; engine required—.25 to .32 2-stroke or .20 to .26 4-stroke; weight—4 to 4¼ pounds; radio required—4-channel.

Part no.—RC74; price—$86.95.

Sig Mfg Co. Inc., 401-7 Front St., Montezuma, IA 50171; (515) 623-5154, fax (515) 623-3922; orders (800) 247-5008; website www.netins.net/showcase/sig; email flysig@netins.net.

CSM

ICG360 Piezo Gyro

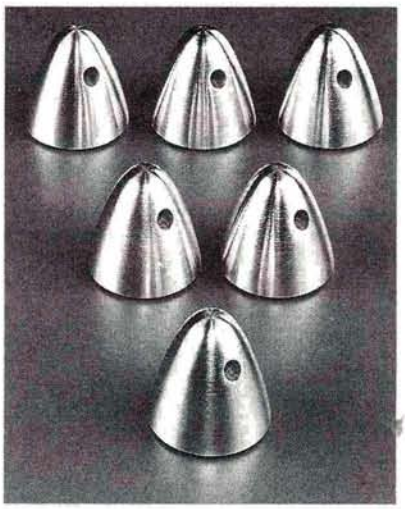
This is the first gyro to offer a "heading lock," which stops helicopter tail drift and returns the tail to the original position. The heading lock makes learning to hover easier and lets experienced pilots execute complicated maneuvers without touching the rudder stick. The ICG360 is compatible with any JR SPCM, ZPCM or PPM (FM) and Futaba PCM1024 and PPM radio systems.

Part no.—CLMG360; price—$299.95.

CSM; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; website www.horizonhobby.com.

DU-BRO PRODUCTS INC.

Aluminum Spinner Prop Nuts



These prop nuts can be used with a standard starting cone and feature an extended surface area to replace the prop washer. They are CNC-machined of 6061-T6 aluminum and meet AMA safety specifications.

Part nos.—730 (¼ in.-28), 731 (5/16 in.-24), 732 (6mm x 1), 733 (7mm x 1), 734 (8mm x 1), 735 (8mm x 1.25); price—$7.50 per package.

Du-Bro Products Inc., 480 Bonner Rd., Wauconda, IL 60084; (847) 526-2136; fax (847) 526-1604; orders (800) 848-9411.

HOBBICO

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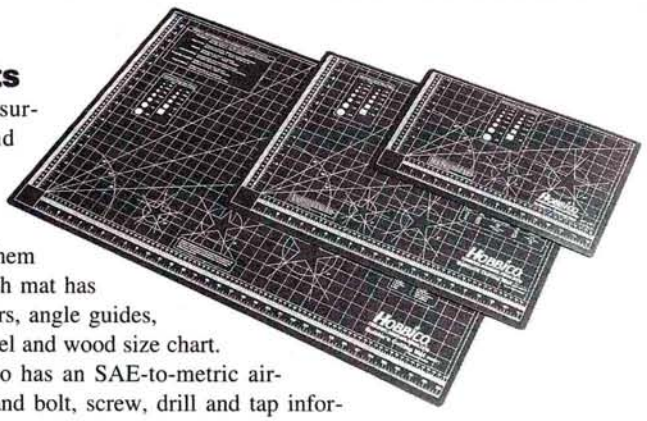

These non-slip cutting surfaces are reversible and feature three-layer construction to extend blade life and a self-closing feature to keep them looking new longer. Each mat has standard and metric rulers, angle guides, star templates and a dowel and wood size chart. The 18x24-inch mat also has an SAE-to-metric airplane conversion chart and bolt, screw, drill and tap information; the 24x36-inch mat also has a measurement conversion chart and an extra, larger star template.

Part nos.—HCAR0454 (12x18 in.), HCAR0455 (18x24 in.), HCAR0456 (24x36 in.); prices—$9.99, $17.99, $31.99.

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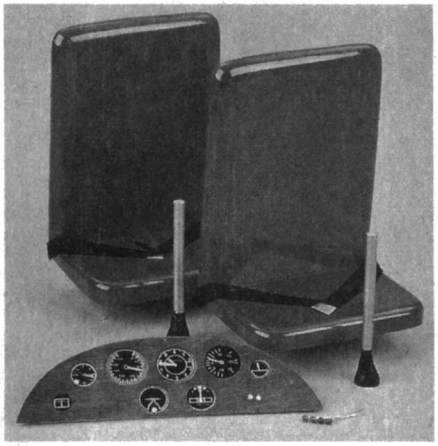


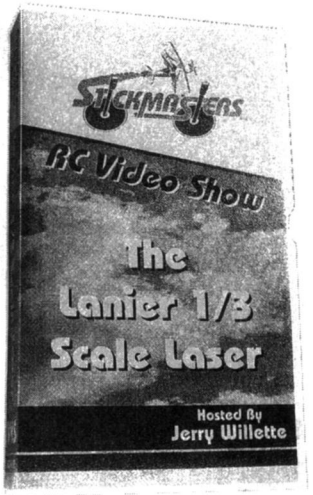
DYNAFLITE

Detail Kit for Piper Super Cub

This accessory kit for the Dynaflite Super Piper Cub outfits the model's cockpit with front and rear vacuum-formed plastic seats, a laser-cut birch/ply instrument panel that's ready for finishing, instrument faces, control sticks and material for making seatbelts.

Part no.—DYFQ8100; price—$24.99.

Dynaflite; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300, fax (217) 398-0008; website www.dynaflite.com.



STICKMASTERS

New Review

Narrated by Jerry Willette, this review of Lanier RC's 1/3-scale Laser shows the contents of the kit, discusses some of the building process and explains radio and engine installation. The video, which includes coupons and gift certificates, also shows how the model flies.

Stickmasters, RR 1, Box 1179, Ft. Ann, NY 12827; (800) 951-7172; fax (518) 793-3947.

DAVE'S CUSTOM MODELS

Cessna 310K

This partial kit features an epoxy/glass fuselage, engine nacelles, cowls and tip tanks and foam wing-cores (the builder supplies the wood). Retract holes, ailerons, wire channels, spar channels and elevators have already been cut out. Specifications: wingspan—120 inches; fuselage length—78 inches; engines required—two .90 glow up to G-23s; weight—28 to 32 pounds; radio required—6-channel.

Price—$695 (plus $35 S&H.)

Dave's Custom Models, 10205 Spring Cir., Austin, TX 78736; (512) 288-2055.

THE SHERATON GROUP

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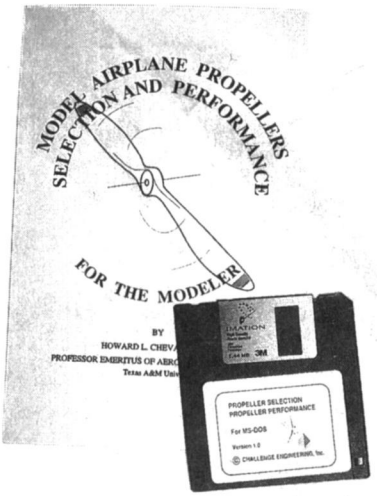
This 177-page book and accompanying computer programs from Howard Chevalier explain how propellers work and teach you to make wise propeller selection decisions that will improve the flight of your aircraft regardless of power system.

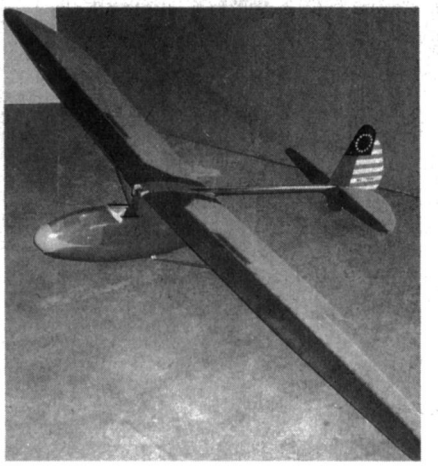


Price—$29.95 (plus $2.95 S&H).

The Sheraton Group, 1722 Broadmoor, Ste. 105, Bryan, TX 77802; (800) 671-0776.

SKY BENCH AEROTECH

Bowlus Baby Albatross



This 122-inch-span short kit features laser-cut parts for CAD-drawn plans for Col. Bob Thacker's model. The kit includes balsa trailing edge parts for the wing, rudder and stab; plywood formers; stab control horn; fin parts; root ribs for wing and stab; steering yoke and instrument panel; balsa ribs for wing, fin, rudder and stab. Plans are available from Bill Northrop's Plans Service, 2019 Doral Ct., Henderson, NV 89014; (702) 896-2162.

Part no.—15REHT; price—$97.80 (plus $5.95 S&H).

Sky Bench Aerotech, P.O. Box 316, Washington, MI 48094; fax and phone (810) 781-7018.

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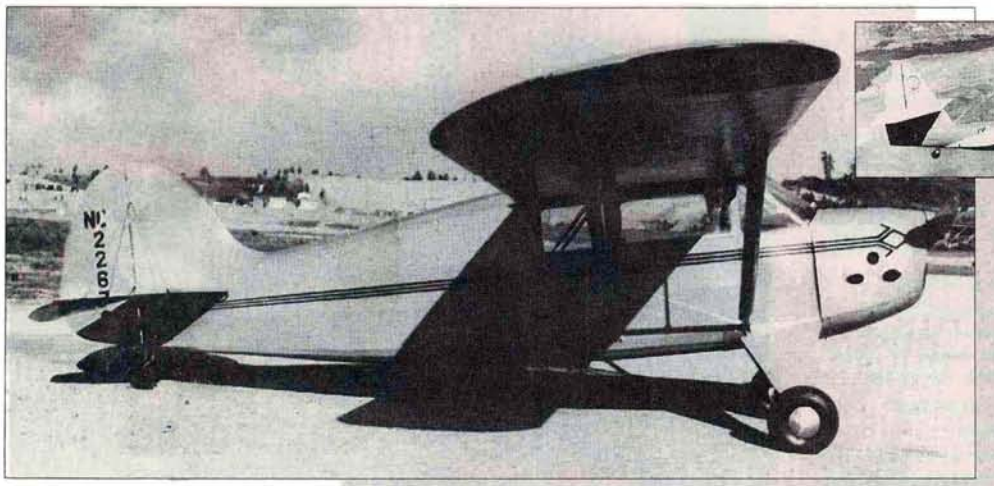
Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?



Congratulations to Frank Nichols of Campbell, CA, for correctly identifying the December 1997 mystery plane, the Volmer Aircraft VJ-21. This aircraft was a low-cost, all-metal sport plane that could land on and take off from rough terrain. Designed by Volmer Jensen in 1945, the 3-passenger coupe was powered by a 75hp Continental engine mounted behind the passenger compartment. The VJ-21 had a cruising speed of 110mph, a range of 500 miles and an average gas consumption of 25 miles to the gallon. A single landing wheel under the fuselage with two retractable wingtip support wheels provided stability for ground handling.

Send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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ADVERTISER INDEX

VOGELSANG'S MESSERSCHMITT 328

Jorg prepares to light the 328's fire. The removable nose section gives unrestricted access to the model's radio and engine ignition systems.

A REGULAR ATTENDEE at the Las Vegas QSAA giant scale fly in is Jorg Vogelsang of Hagen, Germany. Jorg is widely known for his exceptional, giant-scale models and even more so for the extremely high level of craftsmanship he obtains with each project.

Jorg won the Best of Show award at the 1997 QSAA meet with his scratch-built, 27-percent-scale Messerschmitt 328. The original aircraft was built late in WW II and was used to test pulse-jet and turbine engines. Jorg's model is built of fiberglass and carbon fiber and has an aluminum main spar in the wing. Wing construction is mostly carbon fiber. The Me 328 is powered by two AMT turbines producing 22 pounds of thrust each. With a ready-to-fly weight of 45 pounds, the model has an impressive power to weight ratio.

Jorg Vogelsang poses with his impressive Messerschmitt 328. This photo gives you a feeling for the size of Jorg's 27- percent scale turbine-powered model.

Twin AMT turbines, producing 22 pounds of thrust each, power the Me328.

The model is very scale in function, and Jorg has incorporated a retractable, shock absorbing, air-operated landing skid system for landings. A bungie cord and a droppable wheeled dolly are used to catapult the aircraft on takeoff. The entire nose section is removable for access to the radio equipment and to allow the starting of the twin AMT turbines. A split-rudder speed brake helps slow the model during landings.

At the 1997 QSAA event, Jorg flew his Me 328 twice during the noontime flight demo periods, and everyone was impressed with the model's performance. At full power, the AMT turbines are very quiet in operation and provide an exceptional rate of climb; it was obvious that there was lots of power available. The aircraft appears to fly in the 200mph speed range, and landings are done with the engines at idle or shut down completely (they are so quiet, it is hard to tell which).

An interesting note is about the fuel. Jorg uses Jet A1 fuel to power the model. When he went to the local airport to purchase the fuel, the operator would not allow him to put the fuel into a can to bring to the field; he would only sell the fuel if it was put directly into a full-size aircraft. After much discussion, an agreement was made to allow Jorg to purchase five gallons of jet fuel and bring it to the event.

Jorg is an exceptional modeler, and all his aircraft are magnificent, to say the least. His next project will be a 40- to 50-percent-scale Curtiss Pusher biplane, and we just know it will be a masterpiece of engineering. All of his projects are the ultimate in model excellence. —*Jerry Nelson*

SPECIFICATIONS

Type: Messerschmitt 328 (27-percent scale)

Wingspan: 70 in.

Weight: 45 lbs.

Radio used: JR

Engine used: 2 AMT turbines (22 pounds thrust each)

Engine rpm: 110,000

Fuel: Jet A1

Construction: composite, fiberglass and carbon fiber, aluminum main wing spar.

Building time: 8 months

Comments: bungie catapult launch system, retractable, shock absorbing, air-operated landing skid, split-rudder speed brake.

Coming in for another successful landing; you can see the retractable landing skid extended for landing.